BLM LIBRARY
88068042

BLM

FINAL
Environmental Impact Statement for the Buckskin Mine Hay Creek II Coal Lease Application WYW-172684



Wyoming High Plains District

HD
243
.W8
W478
2011

July 2011

Pronghorn grazing on completed reclamation at Buckskin Mine.

NATIONAL SYSTEM OF PUBLIC LANDS
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

MISSION STATEMENT

The BLM's multiple-use mission is to sustain the health and productivity of the public lands for the use and enjoyment of present and future generations. The Bureau accomplishes this by managing such activities as outdoor recreation, livestock grazing, mineral development, and energy production, and by conserving natural, historical, cultural, and other resources on public lands.

BLM/WY/PL-11/045+1320

Cover photo: Buckskin Mine 2007.

United States Department of the Interior
BUREAU OF LAND MANAGEMENT
Wyoming High Plains District
2987 Prospector Drive
Casper, Wyoming 82604-2968

TAKE PRIDE IN AMERICA

In Reply Refer to:
3425 (LBA)(WYP00)
WYW172684
Buckskin Mine Hay Creek II Coal EIS

JUL 19 2011

Dear Reader:

The Bureau of Land Management (BLM) has prepared this Final Environmental Impact Statement (EIS) to document and disclose the results of the environmental analyses of an application received by BLM to lease a maintenance tract of Federal coal approximately 12 miles north of the city of Gillette in the Powder River Basin, Wyoming. The tract is referred to as the Hay Creek II LBA tract. A copy of the EIS document is provided for your review. The final EIS may also be reviewed at the following website:

http://www.blm.gov/pgdata/content/wy/en/info/NEPA/documents/hpd/HayCreekII.html

Copies of the Final EIS are also available for public inspection at the following BLM Offices:

Bureau of Land Management
Wyoming State Office
5353 Yellowstone Road
Cheyenne, WY 82009

Bureau of Land Management
Wyoming High Plains District Office
2987 Prospector Drive
Casper, Wyoming 82604

The Draft EIS was published in March 2010, and the 60-day comment period on the draft document ended on May 10, 2010. A formal public hearing on the application to lease Federal coal was held in Gillette, Wyoming, on April 22, 2010. The purpose of the hearing was to receive comments on the proposed coal lease, on the fair market value, and on the maximum economic recovery of the Federal coal resources included in the tract. There were no statements presented at the formal hearing. Written comments were received from 10 individuals, agencies, businesses, and organizations, during the 60-day public review period. The comment letters received on the Draft EIS during the 60-day public review period have been published as part of the Final EIS in appendix D.

A 30-day review period on this Final EIS will commence on the date the Environmental Protection Agency (EPA) publishes a Notice of Availability in the Federal Register. The BLM will also publish a Notice of Availability in the Federal Register. The BLM will accept public comments on this Final EIS for thirty (30) days commencing on the date the EPA publishes its Notice of Availability in the Federal Register.

If you wish to comment on the Final EIS, your comments should relate directly to the document. Comments should be as specific as possible, and the locations in the document to which you are commenting on should be cited. The BLM is required to respond in the record of decision

(ROD) to all substantive comments submitted. Substantive comments should: (1) give any new information that could alter conclusions; (2) show why or how analysis or assumptions in the Final EIS are flawed; (3) show errors in data, sources, or methods; or (4) request clarifications that bear on conclusions. Opinions or preferences will not receive a formal response. However, they will be considered and included as part of the BLM decision-making process.

This Final EIS was prepared pursuant to the National Environmental Policy Act and applicable regulations, and other applicable statutes, to address possible environmental and socioeconomic impacts that could result from the Buckskin Mine Hay Creek II coal lease application. This Final EIS is not a decision document. Its purpose is to inform the public and agency decision-makers of the impacts associated with leasing some or all of the Hay Creek II Federal coal tract study area to an existing mine in the Wyoming Powder River Basin and to evaluate alternatives to leasing the Federal coal included in the tract as applied for.

Comments, including names, street addresses, and email addresses of respondents, will be on file and open for public review at the Wyoming High Plains District Office during regular business hours, and will be included as part of the ROD posted at the above listed website. Individual respondents may request confidentiality. If you wish to withhold your name or street address from public review or from disclosure under the Freedom of Information Act, you must state this prominently at the beginning of your written comment. Though we cannot guarantee anonymity, such requests will be honored to the extent allowable by law. All submissions from organizations, businesses, and individuals identifying themselves as representatives or officials of organizations or businesses, will be made available for public inspection in their entirety.

Please send written comments to the Bureau of Land Management, High Plains District Office, Attn: Teresa Johnson, 2987 Prospector Drive, Casper, WY 82604. Written comments may also be emailed to the attention of Teresa Johnson at: *hay_creek_II_WYMail@blm.gov*. Email comments must include the name and mailing address of the commentor to receive consideration. Written comments may also be faxed to the attention of Teresa Johnson at (307) 261-7587.

If you have any questions or would like to obtain a copy of this Final EIS, please contact Lesley Collins at (307) 261-7603, or at the above BLM Wyoming High Plains District Office address.

Sincerely,

Eric K Jones

for Stephanie Connolly
District Manager

FINAL ENVIRONMENTAL IMPACT STATEMENT
HAY CREEK II COAL LEASE APPLICATION
CAMPBELL COUNTY, WYOMING

ABSTRACT

Lead Agency:	USDI, Bureau of Land Management, High Plains District Office, Casper, Wyoming
Cooperating Agencies:	USDI, Office of Surface Mining Reclamation and Enforcement, Denver, Colorado Wyoming Department of Environmental Quality (all divisions), Cheyenne, Wyoming
For Further Information Contact:	Teresa Johnson, Bureau of Land Management, 2987 Prospector Drive, Casper, WY 82604; (307) 261-7600

This final environmental impact statement (EIS) assesses the environmental consequences of a decision by the Bureau of Land Management (BLM) to hold a competitive, sealed-bid sale and issue a lease for a federal coal maintenance tract in Campbell County, Wyoming, as a result of a coal lease application submitted by Kiewit Mining Properties, Inc. (Kiewit). As applied for, the Hay Creek II coal lease-by-application (LBA) tract includes approximately 419 acres containing approximately 77.2 million tons of federal coal. If a lease sale is held and the applicant acquires the lease, Kiewit proposes to mine the tract as a maintenance lease for the existing, adjacent Buckskin Mine.

This final EIS describes the physical, biological, cultural, historic, and socioeconomic resources in and around the LBA tract. The alternatives in the final EIS consider the impacts of leasing the tract as applied for, leasing an alternative tract configuration, and not leasing a tract. Impact analyses focused on resource issues and concerns identified during public scoping conducted for the Hay Creek II LBA and during previous analyses conducted for coal leasing actions associated with Buckskin and other local coal mines. Recent concerns related to leasing coal and its subsequent development include: impacts on groundwater, air quality, wildlife, cultural resources, paleontological resources, socioeconomics, loss of livestock grazing areas, conflicts with oil and gas development, cumulative impacts related to ongoing surface coal mining and other proposed development in the Wyoming Powder River Basin, greenhouse gas emissions, ozone, and global climate change.

This final EIS, in compliance with Section 7(c) of the Endangered Species Act as amended, identifies any endangered or threatened species likely to be affected by the Proposed Action and alternatives.

The final EIS is open for a 30-day review period beginning on the date that the U.S. Environmental Protection Agency publishes the Notice of Availability in the *Federal Register*.

Comments postmarked or received on or before the end of the 30-day review period will be considered during preparation of the Record of Decision (ROD). If the BLM decides to hold a sale for the Hay Creek II lease, the final tract configuration will be defined in the ROD.

#76459802g

ID88068042

HD
243
.W8
W478
2011

HAY CREEK II COAL LEASE APPLICATION
FINAL ENVIRONMENTAL IMPACT STATEMENT

Prepared by

ICF International
Gillette, Wyoming

Under the Direction of

U.S. Department of the Interior
Bureau of Land Management
High Plains District Office
Casper, Wyoming

and

Cooperating Agencies

U.S. Department of Interior
Office of Surface Mining
Reclamation and Enforcement
Denver, Colorado

Wyoming Department of Environmental Quality
All Divisions
Cheyenne, Wyoming

July 2011

TABLE OF CONTENTS

EXECUTIVE SUMMARY ES-1

Introduction ES-1
Background ES-1
Evaluation and Environmental Review Process ES-4
Purpose and Need ES-5
Proposed Action and Alternatives ES-6
Resources Addressed in this Environmental Impact Statement ES-12
Summary of General Setting and Environmental Consequences ES-17
General Setting ES-17
Alternative 1 (No Action Alternative) ES-18
Proposed Action and Alternative 2 ..... ES-18
Mitigation ES-37
Cumulative Impacts ES-37

1.0 INTRODUCTION 1-1

1.1 Background 1-2
1.1.1 Buckskin Mine Application 1-2
1.1.2 BLM Coal Leasing Process 1-3
1.1.3 Existing Buckskin Mine 1-10
1.1.3.1 General Description 1-10
1.1.3.2 Mine Facilities and Employees 1-11
1.1.3.3 Mining Methods and Activities 1-11
1.1.3.4 Reclamation Activities 1-13
1.1.3.5 Hazardous and Solid Waste 1-16
1.2 Purpose and Need for Action 1-18
1.3 Regulatory Authority and Responsibility 1-19
1.4 Relationship to BLM Policies, Plans, and Programs 1-21
1.5 Conformance with Existing Land Use Plans 1-21
1.6 Consultation and Coordination 1-23
1.6.1 Initial Involvement 1-23
1.6.1.1 Issues and Concerns 1-24
1.6.1.2 Draft Environmental Impact Statement 1-25
1.6.1.3 Final Environmental Impact Statement 1-25
1.6.2 Future Involvement 1-26
1.6.2.1 Record of Decision 1-26

1.6.2.2 U.S. Department of Justice Consultation 1-26

2.0 PROPOSED ACTION AND ALTERNATIVES 2-1

2.1 Background 2-1
2.2 Description of the Proposed Action and Alternatives 2-2
2.2.1 Proposed Action 2-4
2.2.1.1 Description of the Proposed Tract 2-4
2.2.1.2 Mine Facilities and Employees 2-6
2.2.1.3 Mining Methods and Activities 2-6
2.2.1.4 Reclamation Activities 2-7
2.2.2 Alternative 1 (No Action) 2-7
2.2.3 Alternative 2 (BLM Preferred Alternative) 2-8
2.2.3.1 Description of the BLM Study Area and Tract under Consideration by the BLM 2-8
2.2.3.2 Mine Facilities and Employees 2-11
2.2.3.3 Mining Methods and Activities 2-11
2.2.3.4 Reclamation Activities 2-11
2.3 Eliminated Alternatives 2-12
2.3.1 Alternative 3 2-12
2.3.2 Alternative 4 2-13
2.4 Regulatory Compliance, Mitigation, and Monitoring 2-15
2.5 Summary of Coal Production and Disturbance under the Proposed Action and Alternatives 2-20

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES 3-1

3.1. General Setting 3-20
3.1.1. General Location and Characteristics 3-20
3.1.2. Climate and Meteorology in the General Analysis Area 3-21
3.2. Topography 3-25
3.2.1. Affected Environment 3-25
3.2.2. Environmental Consequences 3-26
3.2.2.1. Proposed Action 3-26
3.2.2.2. Alternative 1 (No Action) 3-27
3.2.2.3. Alternative 2 3-27
3.2.3. Regulatory Compliance, Mitigation, and Monitoring 3-27
3.2.4. Residual Impacts 3-28
3.3. Geology, Mineral Resources, and Paleontology 3-28
3.3.1. General Geology and Coal Resources 3-28

3.3.1.1. Affected Environment 3-28
3.3.1.2. Environmental Consequences 3-32
3.3.1.3. Regulatory Compliance, Mitigation and Monitoring 3-33
3.3.1.4. Residual Impacts 3-33
3.3.2. Other Mineral Resources 3-33
3.3.2.1. Affected Environment 3-33
3.3.2.2. Environmental Consequences 3-36
3.3.2.3. Regulatory Compliance, Mitigation, and Monitoring 3-37
3.3.2.4. Residual Impacts 3-38
3.3.3. Paleontology 3-39
3.3.3.1. Affected Environment 3-39
3.3.3.2. Environmental Consequences 3-41
3.3.3.3. Regulatory Compliance, Mitigation, and Monitoring 3-42
3.3.3.4. Residual Impacts 3-42
3.4. Air Quality 3-42
3.4.1. Background 3-42
3.4.1.1. Air Quality Determinants 3-42
3.4.1.2. Applicable Air Quality Standards and Regulations 3-43
3.4.1.3. Emissions Sources in the General Analysis Area 3-44
3.4.2. Particulate Emissions 3-46
3.4.2.1. Affected Environment 3-46
3.4.2.2. Environmental Consequences 3-57
3.4.2.3. Regulatory Compliance, Mitigation, and Monitoring 3-60
3.4.3. Emissions of Nitrogen Oxides and Ozone 3-63
3.4.3.1. Affected Environment 3-63
3.4.3.2. Environmental Consequences 3-68
3.4.3.3. Regulatory Compliance, Mitigation, and Monitoring 3-69
3.4.4. Visi bility 3-73
3.4.4.1. Affected Environment 3-73
3.4.4.2. Environmental Consequences 3-75
3.4.4.3. Regulatory Compliance, Mitigation, and Monitoring 3-77
3.4.5. Acidification of Lakes 3-78
3.4.5.1. Affected Environment 3-79
3.4.5.2. Environmental Consequences 3-79
3.4.6. Regulatory Compliance, Mitigation, and Monitoring 3-81
3.4.7. Residual Impacts on Air Quality 3-81
3.5. Water Resources 3-81
3.5.1. Groundwater 3-81

3.5.1.1. Affected Environment 3-81
3.5.1.2. Environmental Consequences 3-85
3.5.1.3. Regulatory Compliance, Mitigation, and Monitoring 3-87
3.5.2. Surface Water 3-88
3.5.2.1. Affected Environment 3-88
3.5.2.2. Environmental Consequences 3-90
3.5.2.3. Regulatory Compliance, Mitigation, and Monitoring 3-92
3.5.3. Water Rights 3-92
3.5.3.1. Affected Environment 3-92
3.5.3.2. Environmental Consequences 3-93
3.5.3.3. Regulatory Compliance, Mitigation, and Monitoring 3-95
3.5.4. Residual Impacts 3-95
3.6. Alluvial Valley Floors 3-95
3.6.1. Affected Environment 3-96
3.6.1.1. Studies Conducted to Determine Presence of Alluvial Valley Floors 3-96
3.6.2. Environmental Consequences 3-98
3.6.2.1. Proposed Action 3-98
3.6.2.2. Alternative 1 (No Action) 3-99
3.6.2.3. Alternative 2 3-99
3.6.3. Regulatory Compliance, Mitigation, and Monitoring 3-100
3.6.4. Residual Impacts 3-100
3.7. Wetlands 3-100
3.7.1. Affected Environment 3-100
3.7.2. Environmental Consequences 3-105
3.7.2.1. Proposed Action 3-105
3.7.2.2. Alternative 1 (No Action) 3-106
3.7.2.3. Alternative 2 3-106
3.7.3. Regulatory Compliance, Mitigation, and Monitoring 3-106
3.7.4. Residual Impacts 3-107
3.8. Soils 3-107
3.8.1. Affected Environment 3-107
3.8.2. Environmental Consequences 3-108
3.8.2.1. Proposed Action 3-108
3.8.2.2. Alternative 1 (No Action) 3-109
3.8.2.3. Alternative 2 3-109
3.8.3. Regulatory Compliance, Mitigation, and Monitoring 3-109
3.8.4. Residual Impacts 3-110
3.9. Vegetation 3-110

3.9.1. Affected Environment 3-110
3.9.1.1. Agricultural Cropland 3-111
3.9.1.2. Agricultural Pasture 3-111
3.9.1.3. Bunchgrass Prairie Grassland 3-112
3.9.1.4. Lowland Prairie Grassland 3-112
3.9.1.5. Mixed-Grass Prairie Grassland 3-113
3.9.1.6. Sandy Prairie Grassland 3-113
3.9.1.7. Riparian Bottomland 3-113
3.9.1.8. Big Sagebrush Shrubland 3-114
3.9.1.9. Disturbed Areas 3-114
3.9.1.10. Tree Shelterbelt 3-114
3.9.1.11. Rough Breaks 3-115
3.9.1.12. Open Water 3-115
3.9.2. Environmental Consequences 3-115
3.9.2.1. Proposed Action 3-115
3.9.2.2. Alternative 1 (No Action) 3-116
3.9.2.3. Alternative 2 3-116
3.9.3. Threatened, Endangered, Proposed, and Candidate Plant Species, and BLM Sensitive Species 3-117
3.9.4. Regulatory Compliance, Mitigation, and Monitoring 3-117
3.9.5. Residual Impacts 3-119
3.10. Wildlife 3-119
3.10.1. General Setting 3-119
3.10.2. Survey Requirements and History 3-120
3.10.3. Big Game 3-123
3.10.3.1. Affected Environment 3-123
3.10.3.2. Environmental Consequences 3-124
3.10.4. Other Mammals 3-126
3.10.4.1. Affected Environment 3-126
3.10.4.2. Environmental Consequences 3-126
3.10.5. Raptors 3-128
3.10.5.1. Affected Environment 3-128
3.10.5.2. Environmental Consequences 3-129
3.10.6. Upland Game Birds 3-133
3.10.6.1. Affected Environment 3-133
3.10.6.2. Environmental Consequences 3-144
3.10.7. Other Birds 3-148
3.10.7.1. Affected Environment 3-148

3.10.7.2. Environmental Consequences 3-153
3.10.8. Amphibians, Reptiles, and Aquatic Species 3-157
3.10.8.1. Affected Environment 3-157
3.10.8.2. Environmental Consequences 3-157
3.10.9. Threatened, Endangered, Proposed, and Candidate Animal Species, and BLM Sensitive Species 3-158
3.10.10. Regulatory Compliance, Mitigation and Monitoring 3-159
3.10.11. Residual Impacts 3-161
3.11. Land Use and Recreation 3-162
3.11.1. Affected Environment 3-162
3.11.1.1. Oil and Gas Production 3-165
3.11.1.2. Coal Mining 3-167
3.11.1.3. Recreation 3-167
3.11.2. Environmental Consequences 3-169
3.11.2.1. Proposed Action 3-169
3.11.2.2. Alternative 1 (No Action) 3-169
3.11.2.3. Alternative 2 3-170
3.11.3. Regulatory Compliance, Mitigation, and Monitoring 3-170
3.11.4. Residual Impacts 3-170
3.12. Cultural Resources and Native American Consultation 3-171
3.12.1. Cultural Resources 3-171
3.12.1.1. Affected Environment 3-171
3.12.1.2. Environmental Consequences 3-176
3.12.1.3. Regulatory Compliance, Mitigation, and Monitoring 3-177
3.12.1.4. Residual Impacts 3-177
3.12.2. Native American Consultation 3-177
3.12.2.1. Affected Environment 3-177
3.12.2.2. Environmental Consequences 3-178
3.12.2.3. Regulatory Compliance, Mitigation, and Monitoring 3-178
3.12.2.4. Residual Impacts 3-179
3.13. Visual Resources 3-179
3.13.1. Affected Environment 3-179
3.13.2. Environmental Consequences 3-180
3.13.2.1. Proposed Action 3-180
3.13.2.2. Alternative 1 (No Action) 3-181
3.13.2.3. Alternative 2 3-181
3.13.3. Regulatory Compliance, Mitigation, and Monitoring 3-182
3.13.4. Residual Impacts 3-182

3.14. Noise 3-182
3.14.1. Affected Environment 3-182
3.14.1.1. Noise Terminology 3-182
3.14.1.2. Noise-Sensitive Areas 3-182
3.14.1.3. Existing Noise Sources and Existing Noise Levels 3-184
3.14.2. Environmental Consequences 3-185
3.14.2.1. Proposed Action 3-185
3.14.2.2. Alternative 1 (No Action) 3-187
3.14.2.3. Alternative 2 3-187
3.14.3. Regulatory Compliance, Mitigation, and Monitoring 3-188
3.14.4. Residual Impacts 3-189
3.15. Transportation 3-189
3.15.1. Affected Environment 3-189
3.15.1.1. Roadways 3-189
3.15.1.2. Railways 3-189
3.15.1.3. Oil and Gas Pipelines and Electric Corridors 3-192
3.15.2. Environmental Consequences 3-192
3.15.2.1. Proposed Action 3-192
3.15.2.2. Alternative 1 (No Action) 3-193
3.15.2.3. Alternative 2 3-193
3.15.3. Regulatory Compliance, Mitigation, and Monitoring 3-194
3.15.4. Residual Impacts 3-194
3.16. Hazardous and Solid Waste 3-196
3.16.1. Affected Environment 3-196
3.16.2. Environmental Consequences 3-196
3.16.2.1. Proposed Action 3-196
3.16.2.2. Alternative 1 (No Action) 3-197
3.16.2.3. Alternative 2 3-197
3.16.3. Regulatory Compliance, Mitigation, and Monitoring 3-197
3.16.4. Residual Impacts 3-197
3.17. Socioeconomics 3-198
3.17.1. Local Economy 3-198
3.17.1.1. Affected Environment 3-198
3.17.1.2. Environmental Consequences 3-201
3.17.2. Population 3-203
3.17.2.1. Affected Environment 3-203
3.17.2.2. Environmental Consequences 3-204
3.17.3. Employment 3-205

3.17.3.1. Affected Environment 3-205
3.17.3.2. Environmental Consequences 3-207
3.17.4. Housing 3-207
3.17.4.1. Affected Environment 3-207
3.17.4.2. Environmental Consequences 3-209
3.17.5. Local Government Facilities and Services 3-209
3.17.5.1. Affected Environment 3-209
3.17.5.2. Environmental Consequences 3-211
3.17.6. Social Setting 3-212
3.17.6.1. Affected Environment 3-212
3.17.6.2. Environmental Consequences 3-212
3.17.7. Environmental Justice 3-213
3.17.7.1. Affected Environment 3-214
3.17.7.2. Environmental Consequences 3-214
3.17.8. Regulatory Compliance, Mitigation, and Monitoring 3-215
3.17.9. Residual Effects 3-215
3.17.9.1. Human Health Impact Assessment 3-215
3.18. The Relationship Between Local Short-Term Uses of the Human Environment and the Maintenance and Enhancement of Long-Term Productivity 3-216
3.18.1. Local Area 3-216
3.18.1.1. Topography 3-216
3.18.1.2. Coal Bed Natural Gas 3-216
3.18.1.3. Air Quality and Visual Resources 3-217
3.18.1.4. Water Resources 3-217
3.18.1.5. Vegetation 3-217
3.18.1.6. Wildlife and Wildlife Habitat 3-217
3.18.1.7. Recreational Resources 3-218
3.18.1.8. Socioeconomic Resources 3-218
3.18.2. Human Health Impact Assessment 3-218
3.18.3. Greenhouse Gas Emissions 3-220
3.18.4. Carbon Sequestration 3-224
3.18.5. Regulatory Compliance, Mitigation, and Monitoring 3-224
3.19. Irreversible and Irretrievable Commitments of Resources 3-225

4.0 CUMULATIVE ANALYSES 4-1

4.1 Past, Present, and Reasonably Foreseeable Development 4-4
4.1.1 Coal Development 4-4
4.1.1.1 Coal Mine Development 4-4
4.1.1.2 Coal-Related Development 4-13

4.1.2 Oil and Gas Development 4-20
4.1.2.1 Conventional Oil and Gas 4-20
4.1.2.2 CBNG Development 4-21
4.1.2.3 Oil- and Gas-Related Development 4-22
4.1.3 Other Development Activity 4-26
4.1.3.1 Other Mining 4-26
4.1.3.2 Industrial Manufacturing 4-28
4.1.3.3 Wind Power 4-29
4.1.3.4 Solar Power 4-30
4.1.3.5 Reservoirs 4-31
4.1.3.6 Other Non-Energy Development 4-31
4.2 Affected Environment and Cumulative Environmental Consequences 4-34
4.2.1 Topography and Physiography 4-37
4.2.2 Geology, Mineral Resources, and Paleontology 4-38
4.2.2.1 Geology 4-38
4.2.2.2 Mineral Resources 4-38
4.2.2.3 Paleontology 4-39
4.2.3 Air Quality 4-41
4.2.4 Water Resources 4-53
4.2.4.1 Groundwater 4-53
4.2.4.2 Surface Water 4-67
4.2.5 Channel Stability 4-75
4.2.6 Alluvial Valley Floors 4-77
4.2.7 Soils 4-77
4.2.8 Vegetation, Wetlands, and Riparian Areas 4-78
4.2.8.1 Vegetation 4-78
4.2.8.2 Special-Status Plant Species 4-79
4.2.8.3 Noxious and Invasive Weed Species 4-79
4.2.8.4 Wetland and Riparian Species 4-81
4.2.9 Wildlife and Fisheries 4-81
4.2.9.1 Game Species 4-82
4.2.9.2 Non-game Species 4-85
4.2.9.3 Fisheries 4-86
4.2.9.4 Special-Status Species 4-88
4.2.10 Land Use and Recreation 4-92
4.2.10.1 Grazing and Agriculture 4-93
4.2.10.2 Urban Use 4-94
4.2.10.3 Recreation 4-94

4.2.11 Cultural Resources and Native American Concerns 4-96
4.2.11.1 Prehistoric Sites 4-96
4.2.11.2 Historic Sites 4-98
4.2.11.3 Native American Traditional Cultural Places 4-98
4.2.11.4 Site Protection 4-98
4.2.12 Transportation and Utilities 4-99
4.2.13 Socioeconomics 4-101
4.2.13.1 Employment and the Economic Base 4-102
4.2.13.2 Labor Market Conditions 4-103
4.2.13.3 Personal Income 4-104
4.2.13.4 Population and Demographics 4-105
4.2.13.5 Housing 4-108
4.2.13.6 Public Education 4-112
4.2.13.7 Facilities and Services 4-114
4.2.13.8 Fiscal Conditions 4-115
4.2.13.9 Social Setting 4-118
4.2.14 Emissions and By-Products of Coal Mining and Coal-Fired Power Plants 4-119
4.2.14.1 Greenhouse Gas Emissions, Global Warming, and Climate Change 4-120
4.2.14.2 Cumulative Effects of Combustion of PRB Coal by Power Plants 4-126
4.2.14.3 U.S. Actions and Strategies to Address Greenhouse Gas Emissions 4-132
4.2.14.4 Current and Future Energy Sources and Emissions of Greenhouse Gases in the U.S. 4-134
4.2.14.5 Mercury, Coal Combustion Residues, and Other By-Products 4-138

5.0 CONSULTATION AND COORDINATION 5-1
5.1. Regional Coal Team Consultation 5-1
5.2. Governor's Consultation 5-1
5.3. Public Notice 5-1
5.4. Department of Justice Consultation 5-2
5.5. Other Consultations 5-2
5.6. List of Contributors, Reviewers, and Preparers 5-3
5.7 Distribut ion List 5-6

6.0 REFERENCES CITED 6-1
6.1. Printed References 6-1
6.2. Personal Communication 6-26

7.0 GLOSSARY 7-1

8.0 INDEX OF KEY WORDS 8-1

LIST OF TABLES

Table ES-1. Comparison of Coal Reserves, Lease and Permit Areas, Production, Mine Life, and Revenues ES-11

Table ES-2. Projected Maximum Potential Near-Field Impacts (µg/m^3) ES-40

Table ES-3. Modeled Change in Visibility Impacts at Class I and Sensitive Class II Areas ES-41

Table ES-4. Recent and Projected PRB Population ES-44

Table 1-1. Coal Leases Issued and Exchanges Completed Since Decertification of the Federal Coal Region in 1990, Powder River Basin, Wyoming 1-6

Table 1-2. Pending Coal Leases by Application, Powder River Basin, Wyoming 1-9

Table 1-3. Summary of Land Status Acreage at the Buckskin Mine through December 2008 1-16

Table 2-1. Legal Description of the Proposed Tract 2-4

Table 2-2. Legal Description of the BLM Study Area 2-10

Table 2-3. Legal Description of the Tract Under Consideration by the BLM 2-10

Table 2-4. Regulatory Compliance, Mitigation, and Monitoring Measures for Surface Coal Mining Operations Legally Required for All Alternatives 2-16

Table 2-5. Comparison of Coal Reserves, Lease and Permit Areas, Production, Mine Life, and Revenues by Alternative 2-21

Table 3.2-1. Overburden/Coal Thickness and Postmining Elevation Change 3-27

Table 3.3-1. Stratigraphic Relationships and Hydrologic Characteristics, Powder River Basin, Wyoming 3-29

Table 3.4-1. Assumed Background Air Pollutant Concentrations, Applicable AAQS, and PSD Increment Values (in µg/m^3) 3-45

Table 3.4-2. Buckskin Mine Annual PM_{10} Monitoring Results and Production (µg/m^3) 3-49

Table 3.4-3. Northern PRB Mines: 24-Hour PM_{10} Monitoring Results by Year (µg/m^3) 3-52

Table 3.4-4. Thunder Basin National Grassland Average Ozone Monitoring Results (Parts per Billion) for Last Five Years 3-67

Table 3.4-5. Annual Ambient NO_2 Concentration Data (µg/m^3) 3-71

Table 3.4-6. 1-hour NO_2 Concentrations (parts per billion) 3-72

Table 3.4-7. 1-hour SO_2 Concentrations (parts per billion) Black Hills Power (Wyodak site) 3-73

Table 3.4-8. Distances and Directions from the General Analysis Area to Sensitive Air Quality Areas 3-74

Table 3.4-9. Existing Acid-Neutralizing Capacity in Sensitive Lakes 3-79

Table 3.7-1. NWI-Identified Wetlands in the General Analysis Area 3-103

Table 3.7-2. NWI-Identified Wetlands Confirmed to be Non-Wetlands in the General Analysis Area 3-104

Table 3.7-3. Potential Wetland Impacts under the Proposed Action and Alternatives[a] 3-105

Table 3.9-1. Vegetation Communities in the General Analysis Area 3-111

Table 3.10-1. Potential Impacts on Raptor Nest Sites[a] (Intact and Former) in the General Analysis Area (through 2009) Under the Proposed Action and Alternatives 3-129

Table 3.10-2. Peak Grouse Attendance at Leks in the Vicinity of Buckskin Mine (1984–2009) 3-141

Table 3.10-3. Forty Migratory Bird Species of Management Concern for Wyoming Coal Mines: Historical Occurrence and Status in or within 0.5 Mile of the Buckskin Mine Permit Area[a] (2007–2009) 3-148

Table 3.11-1. Distribution of Oil and Gas Ownership in the Proposed Tract and BLM Study Area 3-165

Table 3.11-2. Current Federal Oil and Gas Leases in the General Analysis Area 3-165

Table 3.12-1. Cultural Sites Previously Identified in the General Analysis Area 3-175

Table 3.17-1. Contribution of Coal Mining to 2008 Assessed Valuation of Campbell County 3-201

Table 3.17-2. Projected Major Revenue Increases under the Proposed Action and Alternatives[a] 3-202

Table 3.17-3. Population Change, 2000 to 2008 3-203

Table 3.17-4. Demographic Characteristics, 2000 3-204

Table 3.17-5. Campbell County Housing Inventory, 2000 and 2007 3-208

Table 3.18-1. Carbon Dioxide Equivalent Conversion Factors 3-222

Table 3.18-2. Estimated Annual Equivalent Carbon Dioxide Emissions at the Buckskin Mine 3-222

Table 4-1. Status and Ownership of Wyoming PRB Coal Mines for 2003, the PRB Coal Review Baseline Year, and for 2007 4-7

Table 4-2. Actual and Projected Wyoming PRB Coal Mine Development, Lower Coal Production Scenario 4-11

Table 4-3. Actual and Projected Wyoming PRB Coal Mine Development, Upper Coal Production Scenario 4-12

Table 4-4. Actual and Projected Wyoming PRB Coal-Related Development (acres) 4-13

Table 4-5. Past, Present, and Projected Wyoming PRB Coal Mine and Coal-Related Development Scenario 4-19

Table 4-6. Actual Wyoming PRB Conventional Oil and Gas Development Scenario 4-21

Table 4-7. Actual Wyoming PRB CBNG Development Scenario 4-22

Table 4-8. Wyoming PRB Conventional Oil and Gas, CBNG, and Related Development Disturbance and Water Production 4-23

Table 4-9. In-Situ Recovery Uranium Projects Currently Proposed in the Task 2 Study Area for the Wyoming portion of the PRB 4-27

Table 4-10. Actual and Projected Wyoming PRB Total Development Scenario, Task 3 Study Area 4-35

Table 4-11. Projected Maximum Potential Near-Field Impacts (µg/m^3) 4-44

Table 4-12. Maximum Predicted PSD Class I and Sensitive Class II Area Impacts (µg/m^3) 4-46

Table 4-13. Modeled Change in Visibility Impacts at Class I and Sensitive Class II Areas 4-49

Table 4-14. Predicted Total Cumulative Change in Acid-Neutralizing Capacity of Sensitive Lakes 4-51

Table 4-15. Recoverable Groundwater in the Fort Union/Wasatch Aquifer System in the PRB 4-54

Table 4-16. Water Use as of 2002 in the Powder/Tongue River Basin (acre-feet per year) 4-68

Table 4-17. Surface Water Availability in the Powder/Tongue River Basin (acre-feet per year) 4-69

Table 4-18. Water Use as of 2002 in the Northeast Wyoming River Basins 4-69

Table 4-19. Surface Water Availability in the Northeast Wyoming River Basins 4-70

Table 4-20. Summary of Proposed Limits for Sodium Absorption Ratios and Electrical Conductivity 4-72

Table 4-21. Impact of CBNG Production Water on Perennial Streams 4-76

Table 4-22. Potential Cumulative Disturbance to Pronghorn Ranges from Development Activities—Lower and Upper Coal Production Scenarios 4-83

Table 4-23. Potential Cumulative Disturbance to White-tailed Deer Ranges from Development Activities—Lower and Upper Coal Production Scenarios 4-83

Table 4-24. Potential Cumulative Disturbance to Mule Deer Ranges from Development Activities—Lower and Upper Coal Production Scenarios 4-84

Table 4-25. Potential Cumulative Disturbance to Elk Ranges from Development Activities—Lower and Upper Coal Production Scenarios 4-84

Table 4-26. Potential Cumulative Impacts on Greater Sage-grouse Leks from Coal Mine Development—Upper and Lower Coal Production Scenarios 4-91

Table 4-27. PRB Land Use by Surface Ownership 4-92

Table 4-28. Animal Unit Months and Acres of Cropland Estimated Unavailable on Lands Disturbed and Not Yet Reclaimed as a Result of Development Activities 4-94

Table 4-29. Square Miles of Projected Cumulative Disturbance and Number of Potentially Affected Cultural Resource Sites in the Task 3 Study Area—Lower and Upper Coal Production Scenarios 4-97

Table 4-30. PRB Rail Lines Coal Hauling Capacity and Projected Use 4-100

Table 4-31. Recent and Projected PRB Population 4-106

Table 4-32. Rental Housing Vacancy Rates 4-108

Table 4-33. Total Housing Stock in 2000 and 2005 4-109

Table 4-34. Monthly Housing Rents in 2006[a] in the PRB Study Area and Percent Change from 2004 4-109

Table 4-35. Summary of Mineral Development Tax Revenues Associated with Energy Resource Production under the Lower Coal Production Scenario (million $) 4-116

Table 4-36. Summary of Mineral Development Tax Revenues Associated with Energy Resource Production under the Upper Coal Production Scenario (million $) 4-117

Table 4-37. Estimated Annual CO_2 Emissions from Projected PRB Coal Production Levels According to Task 2 Report 4-128

Table 4-38. Estimated Annual CO_2 Equivalent Emissions[a] from Coal Production at PRB Mines with Pending LBAs 4-129

Table 4-39. Estimated Annual CO_2 Emissions Produced from Combustion of Coal Produced from the Proposed Tract or BLM Study Area 4-130

Table 4-40. 2004 Percent Contribution to Worldwide Anthropogenic Mercury Emissions 4-140

Table 4-41. Summary Comparison of Magnitude and Duration of Cumulative Impacts[a,b] 4-144

LIST OF FIGURES

Figure 3.1-1. Average Diurnal Temperature by Season at Buckskin Mine 3-22

Figure 3.1-2. Wind Rose for the Buckskin Mine 3-23

Figure 3.1-3. Average Diurnal Wind Speed by Season at the Buckskin Mine 3-24

Figure 3.3-1. North-South and East-West Geologic Cross Sections 3-31

Figure 3.4-1. Buckskin PM_{10} Monitoring History 3-51

Figure 3.4-2. Visibility in the Badlands National Park and Bridger Wilderness Area 3-76

Figure 3.10-1. Average Male Sage-grouse Lek Attendance within the Northeast Wyoming Local Working Group Area (1967–2008) 3-138

Figure 3.10-2. Average Number of Males per Lek Counted in Wyoming (1960–2008) with a Minimum of 100 Leks Checked Each Year 3-139

Figure 3.14-1. Relationship Between A-Weighted Decibel Readings and Sounds of Daily Life 3-183

Figure 4-1. Recoverable Tons of Federal Coal Leased Versus Tons of Coal Mined Since 1990 in Campbell and Converse Counties, Wyoming 4-5

Figure 4-2. Projected and Actual Total Coal Production from Campbell and Converse Counties under the Lower and Upper Production Scenarios 4-10

Figure 4-3. Projected Campbell County Population and Employment to 2020 4-107

Figure 4-4. Projected Housing Demand in the PRB Study Area under the Lower Coal Production Scenario 4-111

Figure 4-5. Projected School Enrollment Trends to 2020 under the Lower Coal Production Scenario 4-113

Figure 4-6. Current and Forecast Mix of Electric Generation Sources 4-137

LIST OF MAPS

Map ES-1. General Location Map with Federal Coal Leases and LBA Tracts ES-2

Map ES-2. Applicant Proposed Tract and Applicant Original (March 2006) Tract ES-3

Map ES-3. Applicant Proposed Tract and BLM Study Area ES-7

Map ES-4. BLM Tract under Consideration and Applicant Original (March 2006) Tract ES-8

Map ES-5. Areas of Disturbance under the Proposed Action ES-14

Map ES-6. Areas of Disturbance under Alternative 1 (No Action) ES-15

Map ES-7. Areas of Disturbance under Alternative 2 ..... ES-16

Map ES-8A. 2011 Maximum Modeled PM10 and NO2 Concentrations for Buckskin Mine Ambient Air Boundary ES-22

Map ES-8B. 2012 Maximum Modeled PM10 and NO2 Concentrations for Buckskin Mine Ambient Air Boundary ES-23

Map ES-9A. Roads, Highways, Occupied Dwellings, Businesses, and School Bus Stops in the Vicinity of the General Analysis Area ES-25

Map ES-9B. Enlargement—Roads, Highways, Occupied Dwellings, Businesses, and School Bus Stops in the Vicinity of the General Analysis Area ES-26

Map ES-10. Extent of Drawdown under the Proposed Action ES-28

Map 1-1. General Location Map with Federal Coal Leases and LBA Tracts 1-4

Map 1-2. Applicant Proposed and Original (March 2006) Tracts 1-5

Map 1-3. Buckskin Mine's Existing Federal Coal Leases and Applicant Proposed Tract 1-12

Map 2-1. Applicant Proposed Tract and BLM Study Area 2-3

Map 2-2. BLM Tract under Consideration and Applicant Original (March 2006) Tract 2-9

Map 3.0-1. Areas of Disturbance under the Proposed Action 3-4

Map 3.0-2. Areas of Disturbance under Alternative 1 (No Action) 3-5

Map 3.0-3. Areas of Disturbance under Alternative 2 3-6

Map 3.4-1. Buckskin Mine Ambient Air Monitoring Network 3-48

Map 3.4-2. 2011 Maximum Modeled PM_{10} and NO_2 Concentrations for Buckskin Mine Ambient Air Boundary 3-55

Map 3.4-3. 2012 Maximum Modeled PM_{10} and NO_2 Concentrations for Buckskin Mine Ambient Air Boundary 3-56

Map 3.4-4A. Roads, Highways, Occupied Dwellings, Businesses, and School Bus Stops in the Vicinity of the General Analysis Area 3-58

Map 3.4-4B. Enlargement - Roads, Highways, Occupied Dwellings, Businesses, and School Bus Stops in the Vicinity of the General Analysis Area 3-59

Map 3.5-1. Currently Active Groundwater Monitoring and Water Supply Wells at the Buckskin Mine 3-82

Map 3.5-2. Extent of Drawdown under Proposed Action 3-86

Map 3.5-3. Surface Water Features in the General Analysis Area 3-89

Map 3.7-1. Wetlands and Other Waters in the General Analysis Area 3-102

Map 3.10-1. Raptor Nests, Prairie Dog Colonies, and Grouse Leks in the Wildlife Survey Area 3-122

Map 3.11-1. Surface Ownership in the General Analysis Area 3-163

Map 3.11-2. Oil and Gas Ownership, Leases, and Facilities in the General Analysis Area 3-164

Map 3.15-1. Transportation Facilities in the Vicinity of the General Analysis Area 3-190

Map 3.15-2. Oil and Gas Pipelines in the General Analysis Area 3-191

Map 4-1. Wyoming Study Area for PRB Coal Review Studies Evaluating Current and Projected Levels of Development 4-3

Map 4-2. Task 3 Study Area Evaluating Projected Environmental Consequences 4-36

Map 4-3. Coal Mine Groundwater Model, Upper Fort Union Formation, Subregion 1—North Gillette, 1990–2010 Coal-Mine-Related Groundwater Level Drawdown 4-59

Map 4-4. Coal Mine Groundwater Model, Upper Fort Union Formation, Subregion 1—North Gillette, 1990–2020 Coal-Mine-Related Groundwater Level Drawdown 4-60

Map 4-5. Coal Mine Groundwater Model, Upper Fort Union Formation, Subregion 1—North Gillette, 1990–2010 CBNG-Related Groundwater Level Drawdown 4-62

Map 4-6. Coal Mine Groundwater Model, Upper Fort Union Formation, Subregion 1—North Gillette, 1990–2020 CBNG-Related Groundwater Level Drawdown 4-63

LIST OF APPENDICES

Appendix A.	Federal and State Agencies and Permitting Requirements
Appendix B.	Unsuitability Criteria
Appendix C.	Coal Lease-by-Application Flow Chart
Appendix D.	Comments on Draft EIS and BLM Responses
Appendix E.	Bureau of Land Management Special Coal Lease Stipulations and Form 3400-12 Coal Lease
Appendix F.	CBNG and Conventional Oil and Gas Wells Capable of Production in the General Analysis Area
Appendix G.	Air Quality Technical Support Document
Appendix H.	Non-Mine Groundwater and Surface Water Rights
Appendix I.	Environmental Quality Council Ruling Respective of Hay Creek Tract as an Alluvial Valley Floor
Appendix J.	Biological Assessment for Federally Listed Species Under The Endangered Species Act
Appendix K.	Bureau of Land Management Sensitive Species Evaluation

Abbreviations and Acronyms Used in this Report

µeq/L	microequivalents per liter
µg/m^3	micrograms per cubic meter
AQRVs	air quality related values
AVF	alluvial valley floor
B.P. bef	ore present
BACT	best available control technology
BAM	Belle Ayr Mine
BHP	Black Hills Power
BLM	U.S. Bureau of Land Management
BNSF	Burlington Northern Santa Fe
Btu	British thermal units
C Cel	sius
C2P2	Coal Combustion Products Partnership
CAA	Clean Air Act
CBNG	coal bed natural gas
CCPs	coal combustion products
CCSD	Campbell County School District
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CMGM	coal mine groundwater model
CO ca	rbon monoxide
CO_2 carb	on dioxide
CO_2e eq	uivalent CO_2
Collins Road	Campbell County Road 23

Corps	U.S. Army Corps of Engineers
CP	Canadian Pacific Railway Ltd.
dB dec	ibel
dBA A-we	ighted decibel
DM&E	Dakota, Minnesota and Eastern Railroad Corporation
DOE	U.S. Department of Energy
dv dec	iview
EC	electrical conductivity
EIS	environmental impact statement
EOR en	hanced oil recovery
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
ESA	Endangered Species Act of 1973, as amended
F	Fahrenheit
FERC	Federal Energy Regulatory Commission
FLPMA	Federal Land Policy Management Act
FMR	federal mineral royalties
GAGMO	Gillette Area Groundwater Monitoring Organization
GHG	greenhouse gas
GSP	gross state product
HFCs hydr	ofluorocarbons
I-90 Interstat	e 90
IMPROVE Interagency	Monitoring of Protected Visual Environments
Kiewit	Kiewit Mining Properties, Inc.
kV kilovolt	
LBA	lease by application
L_{DN}	day-night noise levels

L_{eq}	equivalent noise level
LRPL	least restrictive proposed limit
MAAQS	Montana Ambient Air Quality Standard
McGee Road	Campbell County Road 73
mph	miles per hour
MRPL	most restrictive proposed limit
MSHA	Mine Safety and Health Administration
MW	megawatts
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NEAP	natural events action plan
NEPA	National Environmental Policy Act
NIOSH	National Institute for Occupational Safety and Health
NO	nitrogen oxide
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NRC	U.S. Nuclear Regulatory Commission
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
NWLSWG	Northeast Wyoming Local Sage-Grouse Working Group
OSHA	Occupational Safety and Health Administration
OSM	Office of Surface Mining Reclamation and Enforcement
P&M	Pittsburg and Midway Coal Mining Company
PFCs	perfluorocarbons
PM_{10}	particulate matter measuring 10 micrometers or less in diameter
$PM_{2.5}$	particulate matter measuring 2.5 microns or less in diameter
PRB	Powder River Basin

PRRCT	Powder River Regional Coal Team
PSD	prevention of significant deterioration
REMI	REMI Policy Insight
RMP	resource management plan
ROD	record of decision
RV recre	ational vehicle
SARA	Superfund Amendments and Re-authorization Act
scf/ton	cubic feet of methane per ton of coal mined
SEO	Wyoming State Engineer's Office
SHPO	State Historic Preservation Office
SIP	state implementation plan
SMCRA	Surface Mining Control and Reclamation Act of 1977
SO_2 sulf	ur dioxide
TBNG	Thunder Basin National Grassland
TDS	total dissolved solids
TEOM monitor	Tapered Element Oscillating Microbalance monitor
TSP	total suspended particles
UP Uni	on Pacific
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USGS CHIA	Cumulative Potential Hydrologic Impacts of Surface Coal Mining in the Eastern Powder River Structural Basin, Northeastern Wyoming
VOCs	volatile organic compounds
VRM	visual resource management
WAAQS	Wyoming Ambient Air Quality Standards
WDEQ	Wyoming Department of Environmental Quality
WGFD	Wyoming Game and Fish Department

WIA	Wyoming Infrastructure Authority
WOGCC	Wyoming Oil and Gas Conservation Commission
WSO-RMG	The BLM Wyoming State Office–Reservoir Management Group
Wyoming PRB Oil and Gas EIS	Final Environmental Impact Statement and Proposed Plan Amendment for the PRB Oil and Gas Project, referred to as the

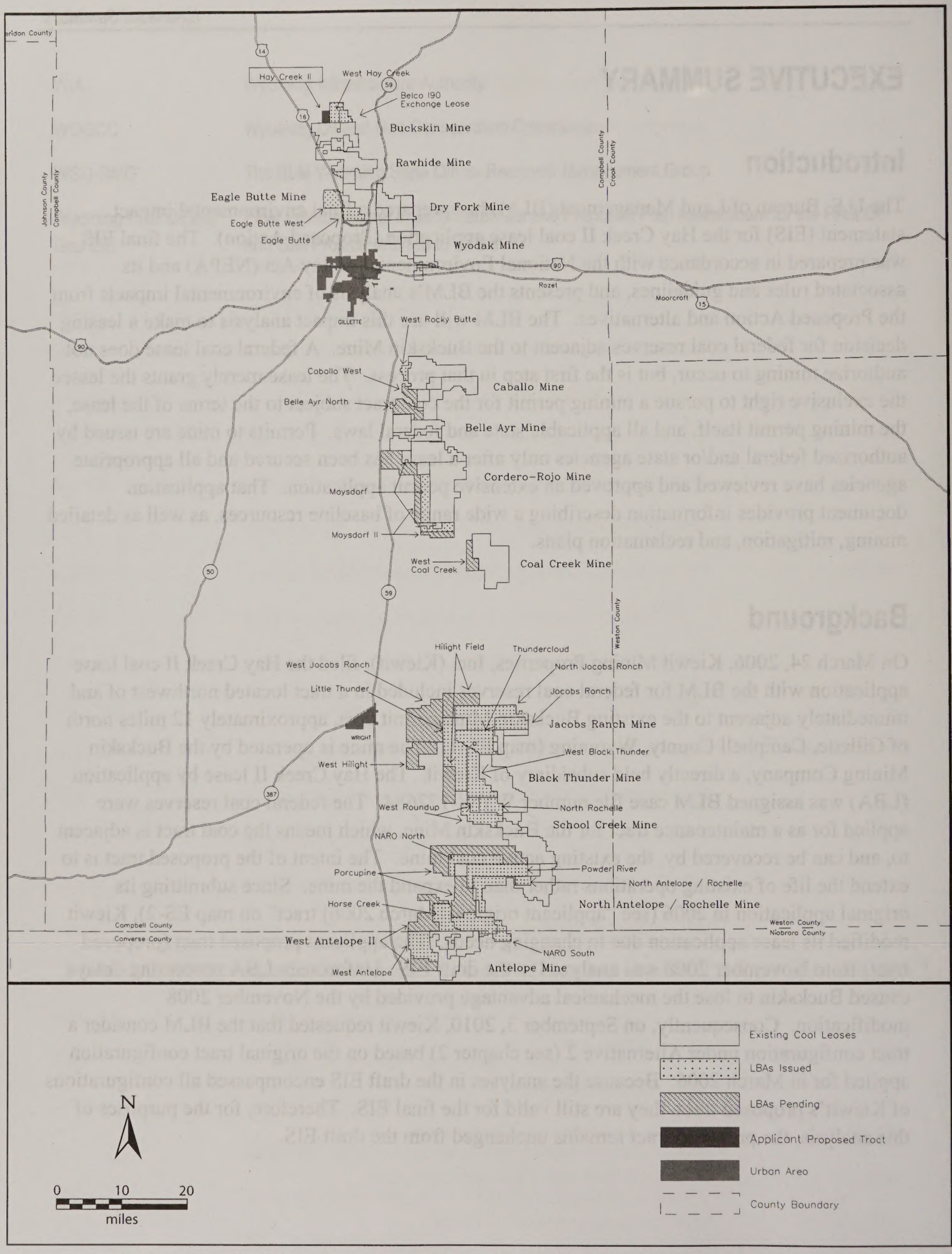
EXECUTIVE SUMMARY

Introduction

The U.S. Bureau of Land Management (BLM) has prepared a final environmental impact statement (EIS) for the Hay Creek II coal lease application (Proposed Action). The final EIS was prepared in accordance with the National Environmental Policy Act (NEPA) and its associated rules and guidelines, and presents the BLM's analysis of environmental impacts from the Proposed Action and alternatives. The BLM will use this impact analysis to make a leasing decision for federal coal reserves adjacent to the Buckskin Mine. A federal coal lease does not authorize mining to occur, but is the first step in that process. The lease merely grants the lessee the exclusive right to pursue a mining permit for the coal tract subject to the terms of the lease, the mining permit itself, and all applicable state and federal laws. Permits to mine are issued by authorized federal and/or state agencies only after a lease has been secured and all appropriate agencies have reviewed and approved an extensive permit application. That application document provides information describing a wide range of baseline resources, as well as detailed mining, mitigation, and reclamation plans.

Background

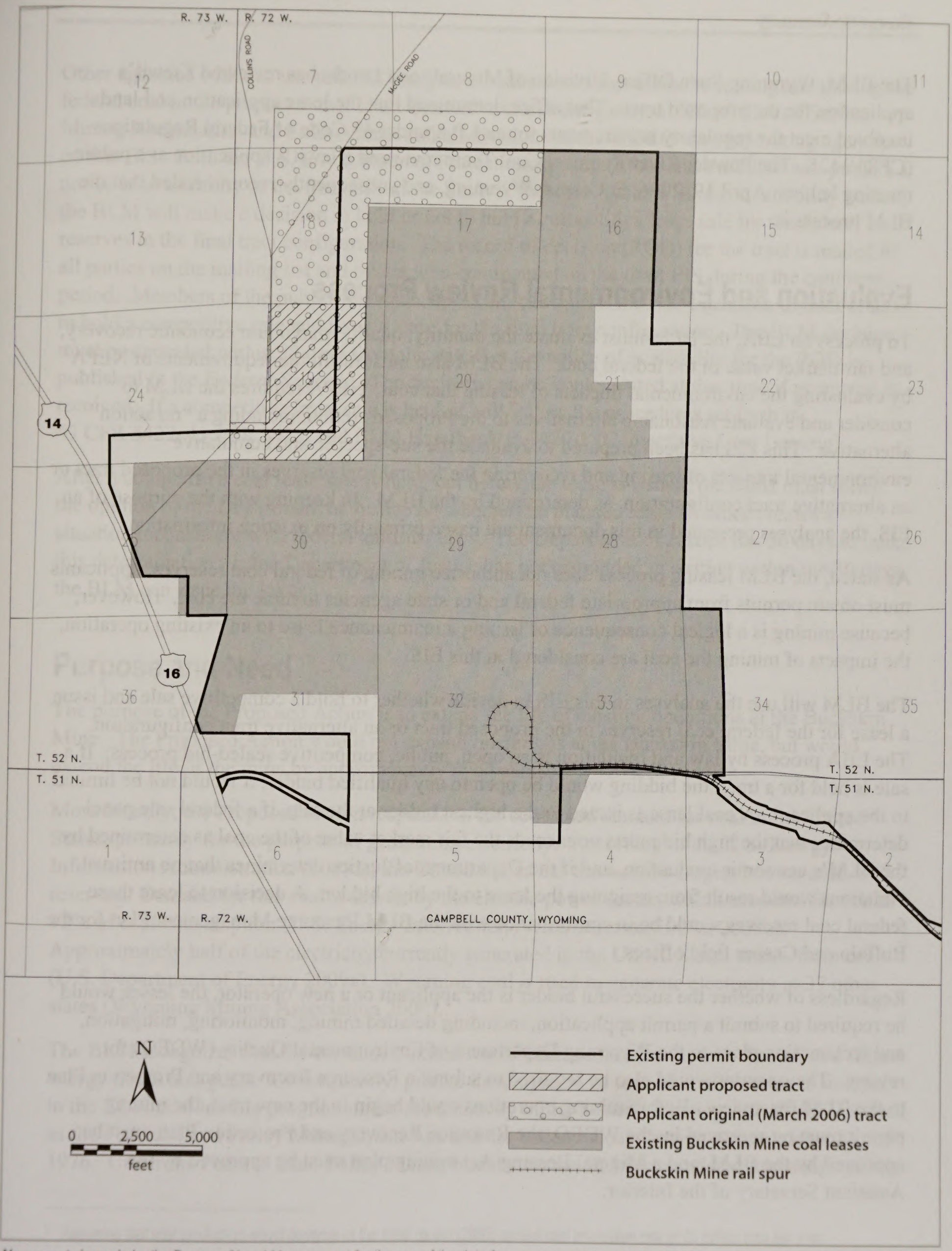
On March 24, 2006, Kiewit Mining Properties, Inc. (Kiewit), filed the Hay Creek II coal lease application with the BLM for federal coal reserves included in a tract located northwest of and immediately adjacent to the existing Buckskin Mine permit area, approximately 12 miles north of Gillette, Campbell County, Wyoming (map ES-1). The mine is operated by the Buckskin Mining Company, a directly held subsidiary of Kiewit. The Hay Creek II lease by application (LBA) was assigned BLM case file number WYW-172684. The federal coal reserves were applied for as a maintenance tract for the Buckskin Mine, which means the coal tract is adjacent to, and can be recovered by, the existing active coal mine. The intent of the proposed tract is to extend the life of existing operations rather than to expand the mine. Since submitting its original application in 2006 (see "applicant original [March 2006] tract" on map ES-2), Kiewit modified its lease application due to changing needs. The applicant proposed tract (proposed tract) from November 2008 was analyzed in the draft EIS. Unforeseen LBA processing delays caused Buckskin to lose the mechanical advantage provided by the November 2008 modification. Consequently, on September 3, 2010, Kiewit requested that the BLM consider a tract configuration under Alternative 2 (see chapter 2) based on the original tract configuration applied for in March 2006. Because the analyses in the draft EIS encompassed all configurations of Kiewit's proposed tract, they are still valid for the final EIS. Therefore, for the purposes of this analysis, the proposed tract remains unchanged from the draft EIS.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map ES-1

General Location Map with Federal Coal Leases and LBA Tracts



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map ES-2

Applicant Proposed and Original (March 2006) Tracts

The BLM, Wyoming State Office, Division of Minerals and Lands, has reviewed Kiewit's application for the proposed tract. That office determined that the lease application and lands involved meet the regulatory requirements for an LBA under 43 Code of Federal Regulations (CFR) 3425. The Powder River Regional Coal Team reviewed Kiewit's application at a public meeting held on April 19, 2006, in Casper, Wyoming, and subsequently recommended that the BLM process it.

Evaluation and Environmental Review Process

To process an LBA, the BLM must evaluate the quantity, quality, maximum economic recovery, and fair market value of the federal coal. The BLM also must fulfill the requirements of NEPA by evaluating the environmental impacts of leasing that coal. NEPA requires the BLM to consider and evaluate reasonable alternatives to the Proposed Action, including a "no action" alternative. This EIS has been prepared to evaluate the site-specific and cumulative environmental impacts of leasing and recovering the federal coal reserves in the proposed tract or an alternative tract configuration, as determined by the BLM. In keeping with the purpose of an EIS, the analyses presented in this document are based primarily on existing information.

As stated, the BLM leasing process does not authorize mining of federal coal reserves; applicants must obtain permits from appropriate federal and/or state agencies to mine the coal. However, because mining is a logical consequence of issuing a maintenance lease to an existing operation, the impacts of mining the coal are considered in this EIS.

The BLM will use the analyses in this EIS to decide whether to hold a competitive sale and issue a lease for the federal coal reserves in the proposed tract or an alternative tract configuration. The LBA process by law and regulation is an open, public, competitive sealed-bid process. If a sale is held for a tract, the bidding would be open to any qualified bidder; it would not be limited to the applicant. A coal lease is issued to the highest bidder at the sale, if a federal sale panel determines that the high bid meets or exceeds the fair market value of the coal as determined by the BLM's economic evaluation, and if the Department of Justice determines that no antitrust violations would result from assigning the lease to the high bidder. A decision to lease these federal coal reserves would be in conformance with the BLM Resource Management Plan for the Buffalo and Casper field offices.

Regardless of whether the successful bidder is the applicant or a new operator, the lessee would be required to submit a permit application, including detailed mining, monitoring, mitigation, and reclamation plans to the Wyoming Department of Environmental Quality (WDEQ) for review. The operator would also be required to submit a Resource Recovery and Protection Plan to the BLM for review. Before mining operations could begin in the new tract, the mining permit must be approved by the WDEQ, the Resource Recovery and Protection Plan must be approved by the BLM, and a Mineral Leasing Act mining plan must be approved by the Assistant Secretary of the Interior.

Other agencies will also use this EIS analysis to make decisions related to leasing and mining the federal coal in the proposed tract or an alternative tract configuration. The Office of Surface Mining Reclamation and Enforcement and all divisions of the WDEQ are cooperating agencies on this EIS. Both the U.S. Environmental Protection Agency (EPA) and the BLM will publish a notice of availability of the final EIS in the *Federal Register*. After a 30-day availability period, the BLM will make a decision to hold or not to hold a competitive lease sale for the federal coal reserves in the final tract configuration. The record of decision (ROD) for the tract is mailed to all parties on the mailing list and others who commented on the draft EIS during the comment period. Members of the public and/or the applicant can appeal the BLM decision to hold or not to hold a competitive sale and issue a lease for the final tract configuration. The BLM decision must be appealed within 30 days from the date that the notice of availability for the ROD is published in the *Federal Register*. The decision can be implemented at that time if no appeal is received. If a competitive lease sale is held, it will follow the procedures set forth in 43 CFR 3422, 43 CFR 3425, and BLM Handbook H-3420-1 (Competitive Coal Leasing).

After a competitive coal lease sale is held, but before the lease is issued, the BLM must solicit the opinion of the Department of Justice on whether the planned lease issuance creates a situation inconsistent with federal antitrust laws. The Department of Justice has 30 days to make this determination. If the Department of Justice has not responded in writing within the 30 days, the BLM can issue the lease.

Purpose and Need

The purpose of the Proposed Action is to extend the life of existing operations at the Buckskin Mine. The Proposed Action would not expand operations at the Buckskin Mine, but would extend the life of the mine by approximately two years[1].

More broadly, the Proposed Action responds to the continued demand for coal in the United States, primarily for the purpose of generating electricity. According to the U.S. Energy Information Administration (2008a), the United States has the world's largest known coal reserves. Demand for this coal is driven by the electric power sector, which accounts for about 92% of coal consumption (U.S. Energy Information Administration 2008a, 2008b). Approximately half of the electricity currently generated in the United States comes from coal (U.S. Department of Energy 2009a). Wyoming coal is used to generate electricity in 37 other states (Wyoming Mining Association 2009).

The BLM recognizes that the continued extraction of coal is essential to meet the nation's future energy needs and goals. Consequently, private development of federal coal reserves is integral to the BLM coal leasing program under the authority of the Mineral Leasing Act of 1920, as well as the Federal Land Policy Management Act and the Federal Coal Leasing Amendments Act of 1976. Under the Federal Land Policy Management Act, the BLM is mandated to manage public

[1] Assuming that coal production would continue at the most recent (2008) annual coal production rate of 25 million tons per year.

lands for multiple-use so that the lands are utilized in the combination that will best meet the present and future needs of the American people.

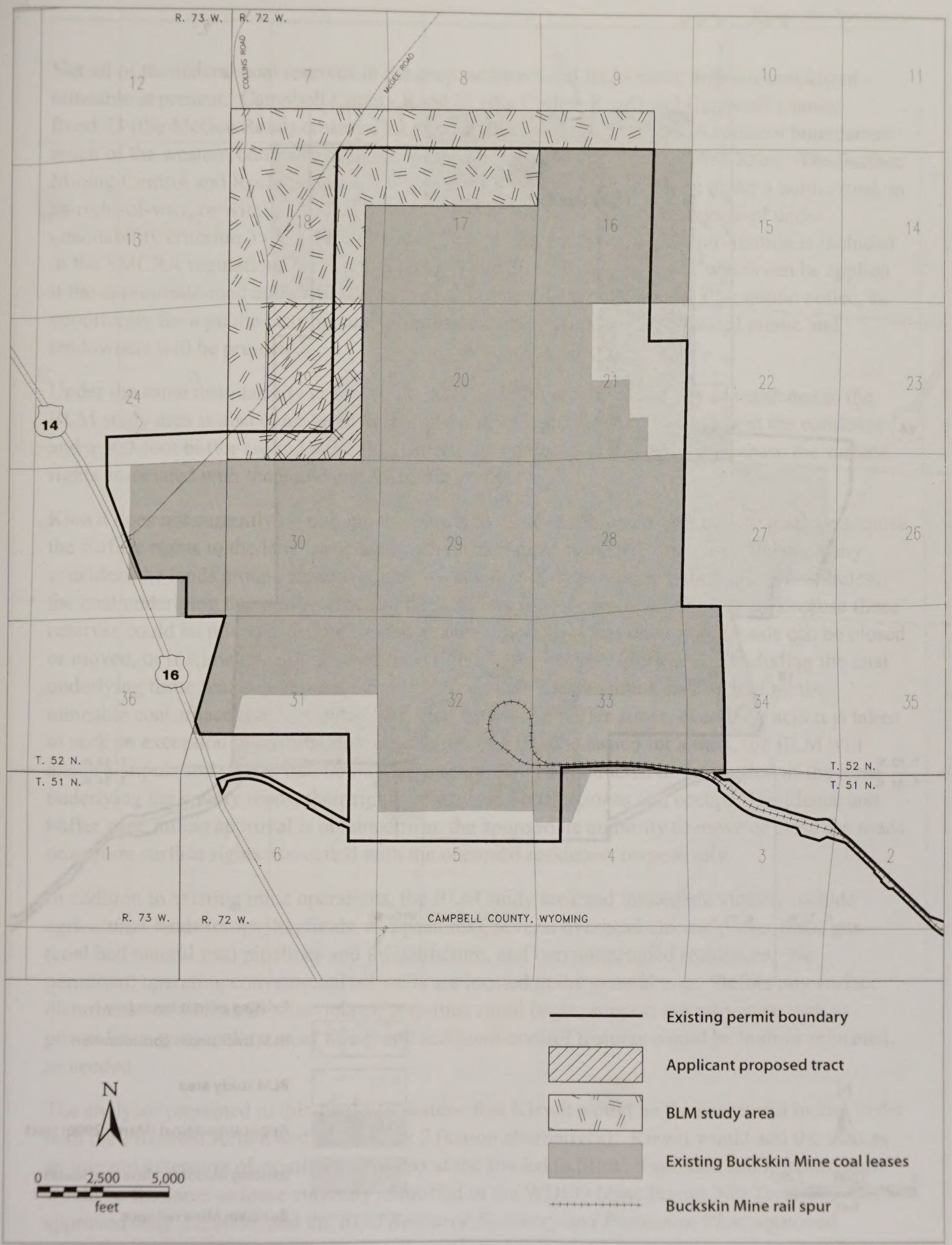
Management of federal coal resources—leasing, mining, and selling—in the Power River Basin (PRB) contributes to a reliable supply of low-sulfur compliance coal for electric power generation in the United States. This domestic supply enables coal-fired power plants to meet current

Clean Air Act requirements and increasing demand without potentially significant increases in power costs while new technologies are developed to improve efficiency and reduce emissions. Management of federal coal resources in the PRB also generates revenue—in the form of bonus, annual rental, and royalty payments—that is used to fund numerous infrastructure and social projects in Wyoming.

Proposed Action and Alternatives

The Proposed Action and two alternatives are analyzed in detail in this final EIS. No new life-of-mine facilities would be built under any of the alternatives; federal coal reserves would be mined as an extension of the existing mine.

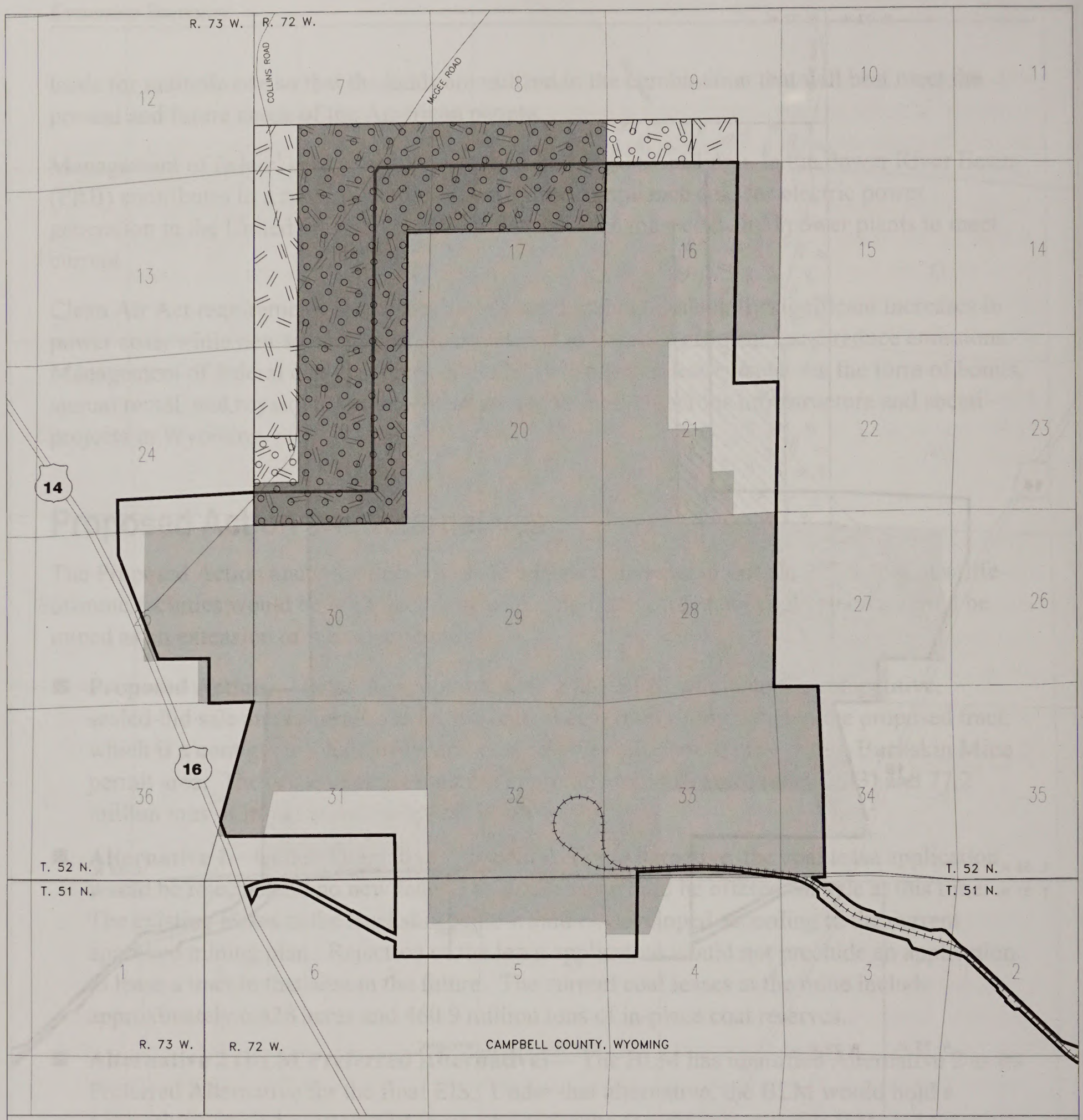
- **Proposed Action**—Under the Proposed Action, the BLM would hold a competitive, sealed-bid sale and issue a lease for the federal coal reserves included in the proposed tract, which is a contiguous block of federal coal reserves adjacent to the existing Buckskin Mine permit area. The proposed tract includes approximately 419 acres (map ES-3) and 77.2 million tons of in-place coal reserves.
- **Alternative 1**—Under Alternative 1, the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be offered for sale at this time. The existing leases at the Buckskin Mine would be developed according to the current approved mining plan. Rejection of the lease application would not preclude an application to lease a tract in that area in the future. The current coal leases at the mine include approximately 6,438 acres and 460.9 million tons of in-place coal reserves.
- **Alternative 2 (BLM Preferred Alternative)**— The BLM has identified Alternative 2 as its Preferred Alternative for the final EIS. Under that alternative, the BLM would hold a competitive, sealed-bid sale and issue a lease for the federal coal reserves included in an alternative tract configuration within the BLM study area (map ES-3), as determined by the BLM. The entire BLM study area (maximum potential lease area) includes up to approximately 1,883 acres and 269.7 million tons of in-place coal reserves. The BLM is considering an alternative tract configuration that is larger than both Kiewit's proposed tract and original (2006) tract, but smaller than the BLM study area (map ES-4). However, the BLM will not identify the final tract configuration until it issues the ROD for this leasing action.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map ES-3

Applicant Proposed Tract and BLM Study Area



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map ES-4

BLM Tract under Consideration and Applicant Original (March 2006) Tract

Not all of the federal coal reserves in the proposed tract and BLM study area are considered mineable at present. Campbell County Road 23 (the Collins Road) and Campbell County Road 73 (the McGee Road) cross the BLM study area from its southern to northern boundaries; much of the western boundary of the proposed tract is adjacent to the Collins Road. The Surface Mining Control and Reclamation Act of 1977 (SMCRA) prohibits mining under a public road, in its right-of-way, or within 100 feet on either side of the right-of-way, as specified under unsuitability criterion 3 (43 CFR 3461.5[c][2][iii]). An exception to this prohibition is included in the SMCRA regulations at section 522(e)(4) and 30 CFR 761.11(d)(2), which can be applied if the appropriate road authority allows the road to be relocated or closed after public notice, an opportunity for a public hearing, and a finding that the interests of the affected public and landowners will be protected.

Under the same unsuitability criterion, the land underlying the only occupied residence in the BLM study area is also considered unsuitable for mining. Surface disturbance at the residence and a 300-foot buffer around it would be prohibited unless Kiewit were to purchase the surface rights associated with the home and its buffer zone.

Kiewit does not currently plan to pursue efforts to close or relocate either county road, or acquire the surface rights to the land associated with the occupied residence; therefore, the company considers the lands around those features inaccessible and operationally limited. Nevertheless, the coal underlying these structures and their buffers is still considered for leasing because those reserves could be mined if the authorized agency determines that one or both roads can be closed or moved, or if Kiewit acquires the surface rights to the occupied residence. Including the coal underlying those features in the lease would also allow for maximum recovery of all the mineable coal adjacent to, but outside of, their respective buffer zones, even if no action is taken to seek an exception to unsuitability criterion 3. If a lease is issued for a tract, the BLM will attach a stipulation stating that no mining activity may be conducted in the portion of the lease underlying the county roads, their rights-of-way, and buffer zones and occupied residence and buffer zone unless approval is obtained from the appropriate authority to move or close the roads or acquire surface rights associated with the occupied residence, respectively.

In addition to existing mine operations, the BLM study area and immediate vicinity include agricultural lands (crops, hayfields, and pastures), several overhead electric power lines, gas (coal bed natural gas) pipelines and infrastructure, and two unoccupied residences. No permitted, operating conventional oil wells are located in the general area. Before any surface disturbance or additional mine-related activities could begin, support infrastructure such as power lines, gas pipelines, and flood- and sediment-control features would be built or relocated, as needed.

The analyses presented in this final EIS assume that Kiewit would be the successful bidder under both the Proposed Action and Alternative 2 (action alternatives). Kiewit would add the tract as an integral extension of existing operations at the Buckskin Mine. Facilities and infrastructure would be the same as those currently identified in the WDEQ Mine Permit 500 Term T7, approved May 22, 2006, and the *BLM Resource Recovery and Protection Plan*, approved

June 16, 2006. Kiewit would submit an application to the WDEQ to amend its existing surface mining permit and mining plan to incorporate the final tract configuration; that application would include detailed amendments to the current monitoring, reclamation, and mitigation plans to include a new lease area.

Table ES-1 describes projected coal production, surface disturbance, mine life, and projected federal and state revenues for the Buckskin Mine under each of the alternatives analyzed in this EIS. These figures are based on the current and projected average annual coal production rate of 25 million tons per year, and the assumption that coal reserves under the public roads and occupied residence would not be mined.

Table ES-1. Comparison of Coal Reserves, Lease and Permit Areas, Production, Mine Life, and Revenues

Item	Existing Buckskin Mine Permit Area	Additional Under Alternative 1 (No Action)	Additional Under Proposed Action	Additional Under Alternative 2
In-Place Coal (as of 12-31-08)	460.9 mmt	0	77.2 mmt[a] 269.	7 mmt[b]
Accessible Mineable Coal (as of 12-31-08)[c]	361.9 mmt	0	60.1 mmt[a] 166.	3 mmt[b]
Recoverable Coal (as of 12-31-08)[d]	344.3 mmt	0	54.1 mmt[a] 149.	7 mmt[b]
% Increase in Estimated Recoverable Coal (as of 12/31/08)[d]	— 0		15.7%	43.5%
Coal Lease Area	6,438.2 acres[e]	0	419.0 acres	1,883.1 acres
Permit Area	8,011.5 acres	0	478.0 acres	2,191.6 acres
Average Annual Post-2008 Coal Production	25 mmt	0	0	0
Remaining Life of Mine (Post-2008)[7]	14 years	0	2 years	up to 6 years
Average Number of Employees	350	0	0	0
Total Projected State and Local Revenues (Post-2008)[f]	$563.6 million	0	$90.6–$108.8 million	$250.2–$300.4 million
Total Projected Federal Revenues (Post-2008)[g]	$417.0 million	0	$69.2–$87.3 million	$191.0–$241.1 million

mmt = million tons

[a] Based on the entire proposed tract, including its overlap with the existing Buckskin Mine permit area.

[b] Based on the entire BLM study area, including its overlap with the existing Buckskin Mine permit area.

[c] Maximum estimate; does not include coal reserves that are inaccessible because of criteria 3 (i.e., reserves beneath the occupied residence and associated 300-foot buffer zone; or the public road rights-of-way [Collins and McGee roads], their associated 100-foot buffer zones, and other operationally limited lands between the two roads).

[d] Assumes a recovery rate of 95% for coal in the Canyon seam and a 90% for all other coal reserves; does not include coal left behind as support pillars and similar structures, or unavoidably lost through spillage and spontaneous natural fires during normal mining operations.

[e] Includes federal and state coal leases currently held by the Buckskin Mining Company.

[f] Revenues to the State of Wyoming and local governments include severance taxes; property and production taxes (ad valorem); sales and use taxes; and Wyoming's share of federal royalty payments, bonus bids, annual rental payments, and Abandoned Mine Land fees. State revenues are based on an assumed price of $7.85 per ton of "recoverable coal," federal royalty of 12.5% of the value less 51% federal share, plus $0.315 per ton for Abandoned Mine Land fees on assumed 25% state share, plus bonus payments of between $0.30 and $0.97 per ton of LBA leased coal per ton (based on average of six LBAs in 2004 and 2005) times the tonnage of recoverable coal times a 50% state share, plus $0.07 per ton estimated sales and use taxes, plus $0.33 per ton estimate for ad valorem taxes, plus $0.415 per ton in severance taxes. Only the sales and use taxes paid directly by the mine are considered (i.e., taxes generated by vendors and suppliers and by consumer expenditure supported directly and indirectly by the mine are not included. These figures could change based on the outcome of recent legislation that changed the percentage of distribution to states.

[g] Federal revenues are based on an assumed price of $7.85 per ton, federal royalty of 12.5% times 51% share, plus $0.315 per ton for Abandoned Mine Land fees times an assumed 75% federal share, plus black lung tax of $0.00261 per ton, plus bonus payments of between $0.30 and $0.97 per ton of LBA leased coal (based on the range of the six LBA sales in 2004 and 2005) times tonnage of recoverable coal minus a 50% federal share. These figures could change based on the outcome of recent legislation that changed the percentage of distribution to states.

Other alternatives that were considered but eliminated from further analysis in this EIS include:

- **Alternative 3**—Under Alternative 3, the BLM would hold a competitive, sealed-bid sale and issue a lease for a coal tract to a successful bidder other than the applicant for the purpose of developing a new stand-alone mine.
- **Alternative 4**—Under Alternative 4, the BLM would delay the sale of a new coal tract with the goal of increasing the public benefit should higher coal prices be in place at a later date

and/or to allow more complete recovery of the potential coal bed natural gas (CBNG) resource prior to mining.

The current economies of mining in the Powder River Federal Coal Region appear to make construction of a new mine economically unfeasible using estimated in-place coal reserves in the proposed tract or alternative tract configuration. The BLM currently estimates that a tract would need to include as much as 500 to 600 million tons of in-place coal to attract a buyer interested in opening a new mine in the Wyoming PRB. Neither the proposed tract (approximately 77 million tons) nor the BLM study area (about 270 million tons) includes sufficient in-place coal resources to justify the costs of opening a new mine. Given these limitations and other assumptions associated with a new mine start, such as the necessary annual production and competition for market share, Alternative 3 is not analyzed further in this EIS. Alternative 4 was not analyzed in detail because it would not produce substantially different impacts from the alternatives analyzed in this EIS; only the timing and possibly the economic return of the sale would differ.

Resources Addressed in this Environmental Impact Statement

The general analysis area represents the maximum surface area that could be disturbed by mining operations (coal extraction and support activities) analyzed in this EIS; it encompasses approximately 2,847.3 acres (map ES-5). The BLM requires that certain elements are analyzed when present in the affected environment. Maps ES-5 through ES-7 show the Proposed Action and two alternatives analyzed in this EIS for most resources, as well as the maximum potential surface disturbance within the general analysis area associated with each alternative.

Required elements present in the general analysis area and addressed in this EIS include:

- air quality (section 3.4);
- water quality (section 3.5);
- wetlands/riparian zones (section 3.7);
- invasive non-native species (section 3.9);
- threatened and endangered species (sections 3.9 and 3.10);
- cultural resources (section 3.12);
- hazardous or solid wastes (section 3.16);
- Native American religious concerns (section 3.17); and
- environmental justice (section 3.17).

The following additional resources also are present in the general analysis area and are addressed in this EIS:

- topography and physiography (section 3.2);
- geology, mineral, and paleontological resources (section 3.3);

- other water resources (section 3.5);
- alluvial valley floors (section 3.6);
- soils (section 3.8);
- vegetation (section 3.9);
- wildlife (section 3.10);
- land use and recreation (section 3.11);
- visual resources (section 3.13);
- noise (section 3.14);
- transportation resources (section 3.15); and
- socioeconomics (section 3.17).

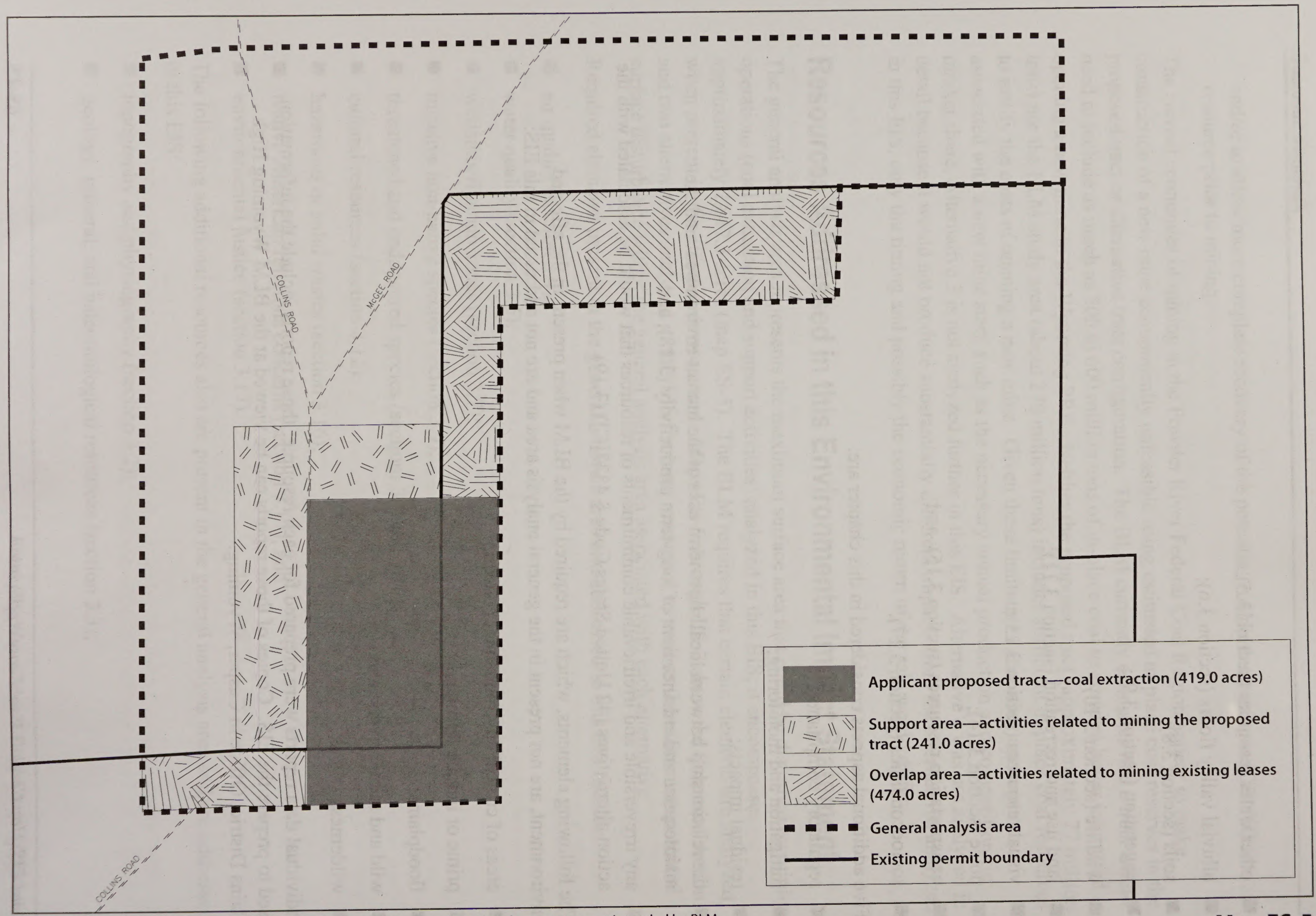
Five additional aspects considered in this chapter are:

- regulatory compliance;
- mitigation and monitoring;
- residual impacts;
- the relationship between local short-term uses of the human environment and the maintenance and enhancement of long-term productivity (3.18); and
- any irreversible and irretrievable commitments of resources that would be associated with the action alternatives (42 United States Code § 4332[C]) (3.19).

The following elements, which are required by the BLM when present in the affected environment, are not present in the general analysis area and are not addressed in this EIS:

- areas of critical environmental concern;
- prime or unique farmlands;
- floodplains;
- wild and scenic rivers; and
- wilderness.

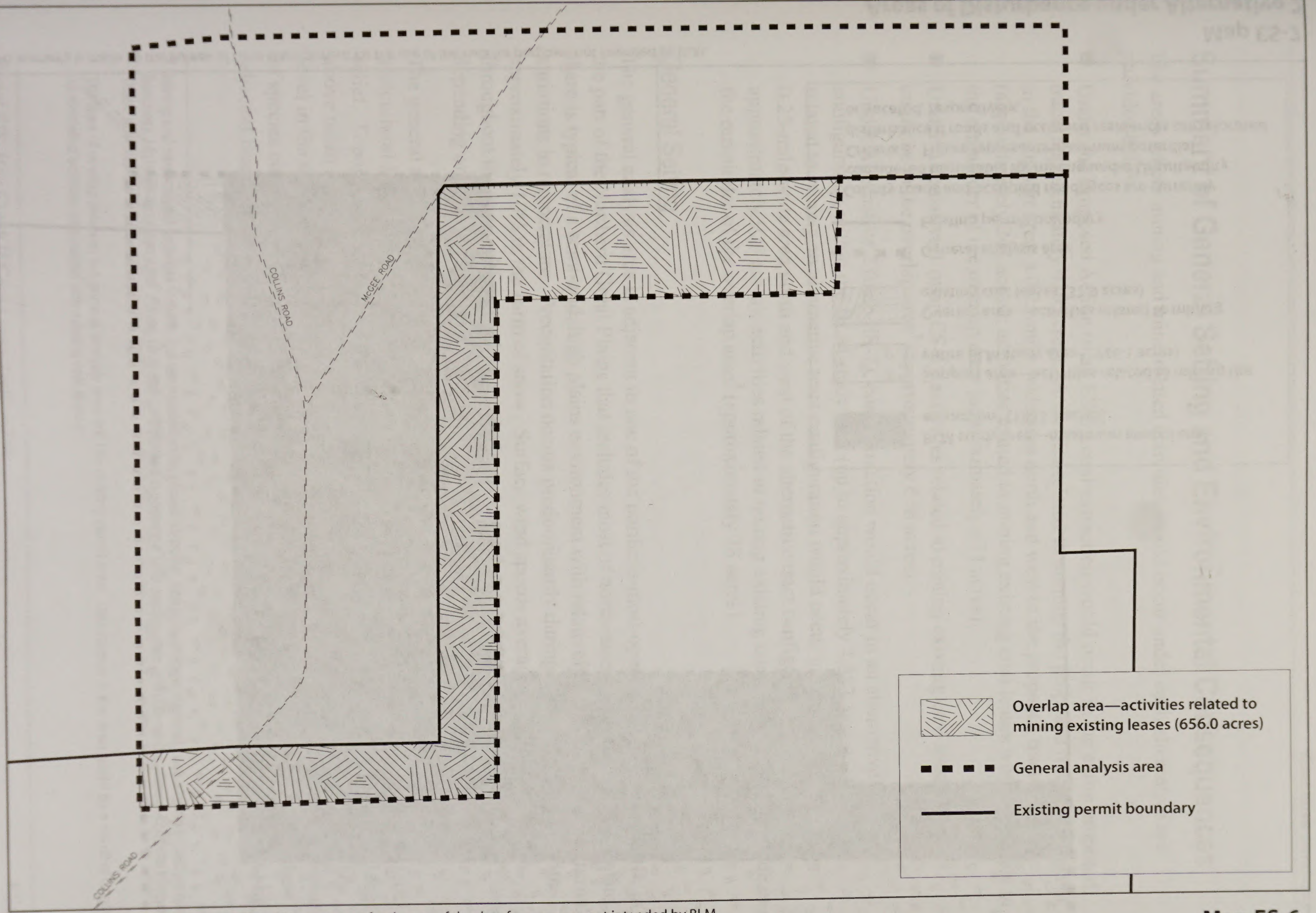
Individual data reports were prepared for each resource; those reports include the information used to prepare the EIS. Copies of those reports can be viewed at the BLM Wyoming High Plains District Office in Casper, Wyoming.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map ES-5

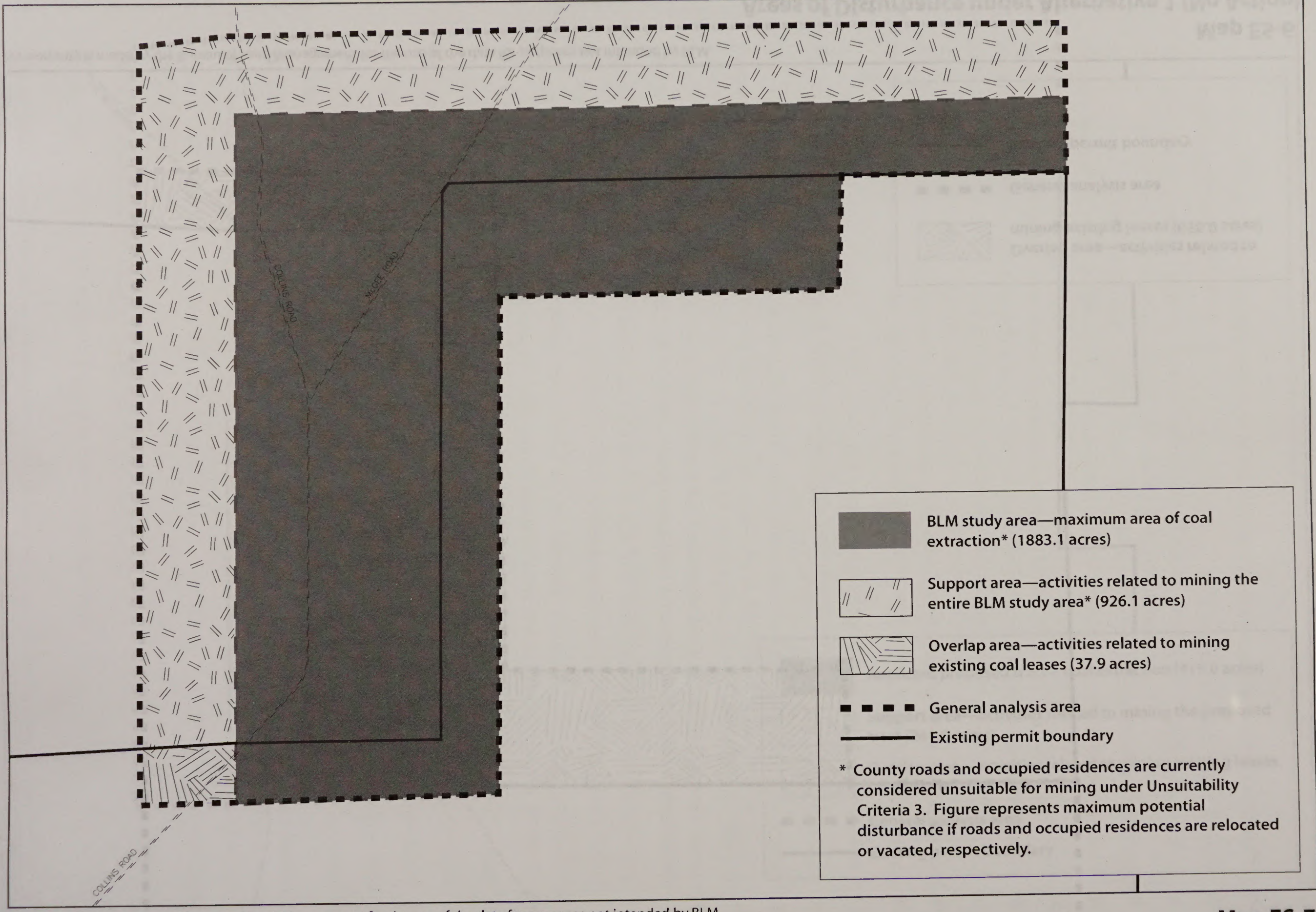
Areas of Disturbance under the Proposed Action



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map ES-6

Areas of Disturbance under Alternative 1 (No Action)



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map ES-7

Areas of Disturbance under Alternative 2

Summary of General Setting and Environmental Consequences

The areas where mining and mine-related activities would occur under each alternative are provided below.

- Under the Proposed Action (map ES-5), coal extraction would occur in the entire proposed tract (approximately 419 acres). Activities related to mining[2] the proposed tract would occur in the support area, a 0.25-mile-wide area north and west of the proposed tract (approximately 241 acres); activities related to mining existing coal leases would continue in the remainder of the overlap area[3] (approximately 474 acres).
- Under Alternative 1 (map ES-6), activities related to mining existing coal leases would continue in the overlap area[3] (approximately 656 acres).
- Under Alternative 2 (map ES-7), coal extraction would occur in an alternative tract configuration within the BLM study area (up to approximately 1,883 acres). Activities related to mining an alternative tract configuration would occur in the support area, a 0.25-mile-wide area north and west of the alternative tract configuration (up to approximately 926 acres); activities related to mining existing coal leases would continue in the remainder of the overlap area[3] (approximately 38 acres).

General Setting

The general analysis area is adjacent to one of the northern-most operating mines in the PRB, in the part of the Northern Great Plains that includes most of northeastern Wyoming. The climate there is typical of a semi-arid, high plains environment with relatively large seasonal and diurnal variations in temperature. Precipitation occurs predominantly during the spring and fall, with approximately 10% in the form of snow. Surface wind speeds average 10.5 miles per hour throughout the year, with prevailing winds from the north-northwest and south-southeast, depending on the season.

The general analysis area is characterized by gently rolling uplands and relatively level agricultural fields; many hills are dissected by drainages that create moderate variations in local relief. Topographic elevations in the general analysis area range from approximately 4,080 feet above mean sea level along Hay Creek in the northern tier to about 4,380 feet above mean sea level in the southwestern portion of the area. The vegetation in the general analysis area consists of species common to eastern Wyoming and is consistent with vegetative communities in the adjacent Buckskin Mine permit area. The proposed tract is dominated (approximately 71%) by

---

[2] Mining and mine-related activities include, but are not limited to, topsoil stripping, stockpile storage, highwall back-sloping (including catch benches), highwall reduction after mining to match undisturbed topography, and construction of flood- and sediment-control structures. These activities are described in section 1.1.3.3.

[3] The area of overlap between the general analysis area and the existing permit area. Disturbance in this area would be a result of ongoing mine-related activities associated with existing coal leases.

various upland grasslands. The general analysis area is comprised primarily of upland grasslands (approximately 40%) and agricultural lands (croplands and pastures, 31%).

Summary of Impacts

Impacts were identified in this EIS based on criteria set forth by the Council on Environmental Quality (40 CFR 1508.27), BLM NEPA Handbook H-1790-1, and the professional judgment of the specialists completing the analyses. Impacts can be beneficial or adverse, and can be a primary result (direct) of an action, a secondary result (indirect), or cumulative; cumulative impacts are discussed in chapter 4. They can be short-term (operational, persisting during active mining and reclamation); long-term (persisting through the time the reclamation bond is released—minimum of 10 years beyond active reclamation), or permanent. Impacts also vary in terms of significance. Significance can range from no impact or negligible impacts to substantial or significant impacts. Impacts can also be substantial during mining but reduced to no impact or negligible following completion of reclamation. In this EIS, impacts are considered to be adverse unless specifically identified as beneficial.

As described above, the general analysis area represents the maximum surface area that could be disturbed by mining activities analyzed in this EIS. Surface disturbance occurs outside of a coal lease area as a result of activities necessary to support mining including, but not limited to, topsoil stripping, stockpile storage, highwall back-sloping (including catch benches), highwall reduction after mining to match undisturbed topography, and construction of flood- and sediment-control structures.

Alternative 1 (No Action Alternative)

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. However, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future. Under this alternative, impacts in the general analysis area would be limited to its overlap with the existing Buckskin Mine permit area (approximately 656 acres), and would consist of short-term surface disturbance from activities necessary to support mining on existing leases. In most cases, impacts under the No Action Alternative are the same or similar to those for the action alternatives, but would occur in the limited overlap area and would most often be short-term.

Proposed Action and Alternative 2

The following summary focuses on the expected impacts of the two action alternatives analyzed in this EIS.

Topography

Under both action alternatives, surface coal mining would have a moderate, permanent impact on the topography of the proposed tract or BLM study area through blasting, hauling, and stockpiling of overburden and interburden, and from coal extraction. Postmining topography

would be recontoured under either scenario to resemble the premining topography and the basic drainage system would be retained, but the reclaimed lands would be approximately 60 feet lower and somewhat gentler and more uniform in appearance.

These changes in the landscape would result in minor to moderate, long-term reductions in microhabitats and habitat diversity in the affected area. As discussed under the Wildlife Resources heading below, effects on wildlife would be minor to moderate, depending on the species, and long-term. Long-term beneficial impacts of the lower and flatter terrain would be reduced water runoff, which would increase infiltration rates for precipitation and reduce erosion, and may also increase vegetative productivity and potentially accelerate recharge of groundwater. These topographic changes would not conflict with regional land use, and the postmining topography would be designed to adequately support the anticipated future land use of the mined area.

Geology and Coal Resources

The Paleocene Fort Union Formation is the stratigraphic unit (i.e., geological layer) which contains the coal seams that would be mined under the action alternatives. This formation is divided into the Tongue River, Lebo, and Tullock members. The Anderson and Canyon coal seams of the Tongue River Member are targeted for mining in the BLM study area (the maximum extent of leasable coal in the general analysis area).

Under both action alternatives, removal of overburden, interburden, and coal reserves would have a significant, permanent impact on the geology and coal resources on up to 419 acres in the proposed tract and 1,883 acres in the BLM study area, with the area of impact depending on the final tract configuration. An average of about 250 feet of overburden and interburden, 30 feet of Anderson coal, and 70 feet of Canyon coal would be removed under either action alternative. Approximately 54 million tons of coal would be recovered from the proposed tract, and up to 149.7 million tons from the BLM study area.

Overburden removed during mining would be replaced with a relatively homogenous mixture of partially compacted rock and soil that would be significantly and permanently altered from the original distinct layers. Activities related to mining and reclamation would cause short-term surface disturbance in the support area for the final tract configuration.

Other Minerals

The Anderson and Canyon coal seams tapped for CBNG development are the same seams that are being mined at the Buckskin Mine. Wyoming Oil and Gas Conservation Commission records indicate that as of May 2008, 30 CBNG wells have been completed in the general analysis area. Half of those wells are producing and the rest have been shut in, are no longer producing, have been permanently abandoned, or have expired permits. Commission records indicate that no CBNG wells have been completed below the Anderson and Canyon seams within the general analysis area. No conventional oil and gas wells are located in the general analysis area. Additionally, no bentonite or uranium reserves have been identified in the general

analysis area. Clinker (known locally as scoria or red dog) breaks are absent from the proposed tract, but do occur on limited hillsides along the northern edge of the general analysis area.

Under the action alternatives, development of other minerals present in the general analysis area could not occur during mining, but could resume after mining. Surface coal mining would have permanent impacts on unrecovered oil and gas (conventional and CBNG) resources located in and above the mined coal seams. Resources that are not recovered prior to mining would be irretrievably lost when the coal is removed. Dewatering wells and active mining would combine with ongoing CBNG production to deplete the hydrostatic pressures and gas resources adjacent to mining areas a short time after mining would begin.

The action alternatives would have no impact on bentonite or uranium resources because they are not present in the general analysis area. Mining would remove or reduce limited clinker resources along the northern portion of the general analysis area, resulting in a permanent loss of those resources and a change in topographic relief.

Paleontological Resources

Two formations exposed on the surface of the general analysis area could contain paleontological resources: the Paleocene Fort Union Formation and the Paleocene and Eocene Wasatch Formation (Breckenridge 1974; Love and Christiansen 1985). Both of these sedimentary formations are known to yield vertebrate fossils in Wyoming (Estes 1975; Roehler 1991; Secord 1998; Robinson et al. 2004).

No significant or unique paleontological resources have been reported by the Buckskin Mine and none were recorded on the surface in the general analysis area during surveys conducted for the EIS. No specific mitigation was recommended for the action alternatives and no further paleontological work was recommended or required. Additional surveys for paleontological resources may be required if discoveries are made during mining operations. Undiscovered resources not exposed on the surface or detected during mining would be permanently lost.

Air Quality

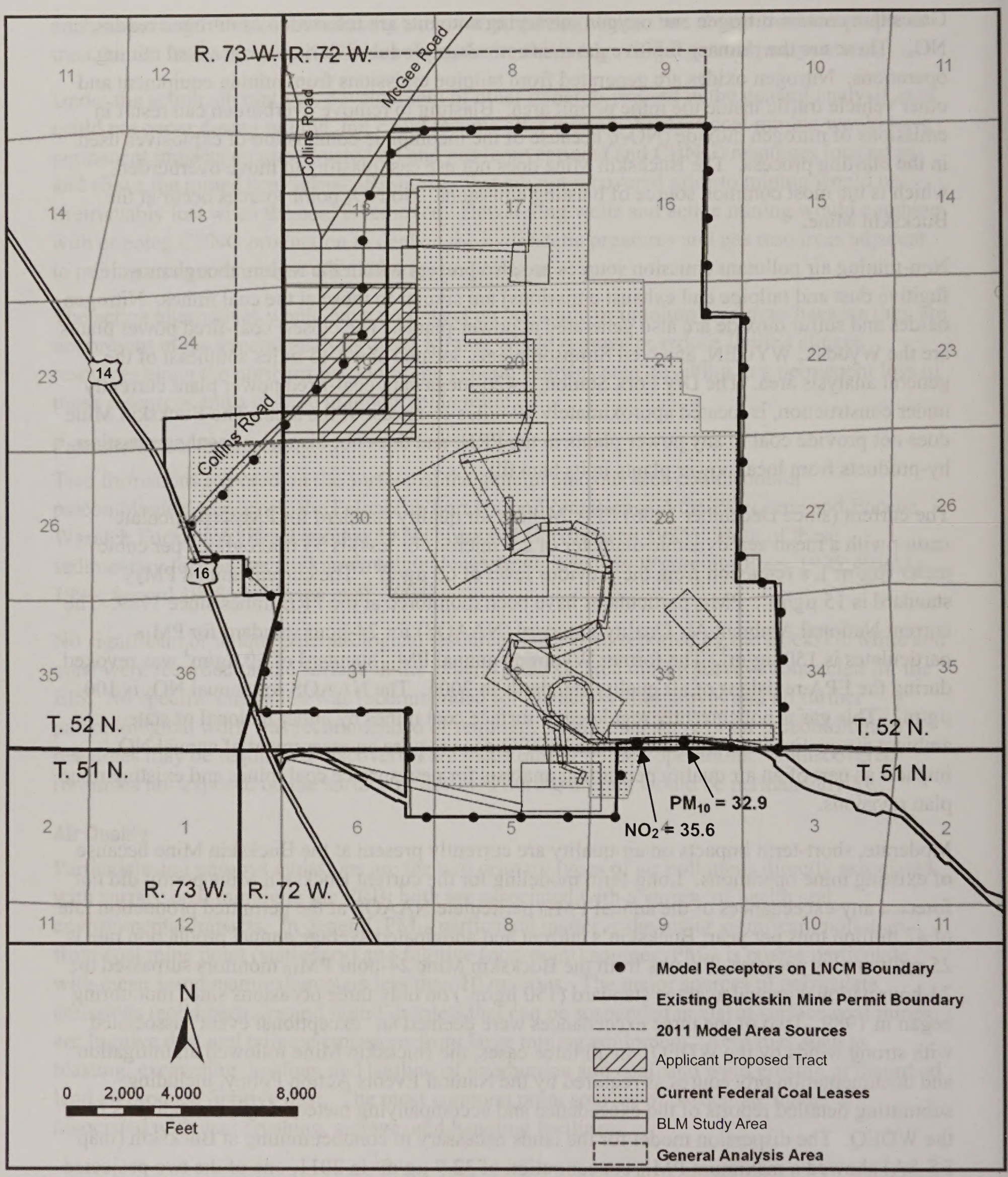
Particulate and gaseous emissions are the two primary types of air pollutants directly associated with surface coal mining in the PRB; both are associated with a variety of health and environmental impacts. In general, PM_{10} particulate matter is the major significant pollutant from coal mine point (stationary) and fugitive (non-point) sources; PM_{10} is coarse particulate with mean aerodynamic diameters less than 10 microns. The major sources of particulate emissions (solid particles and liquid droplets that can be suspended in air) at surface coal mines are fugitive dust and tailpipe emissions from large mining equipment. Activities such as blasting, excavating, loading, and hauling of overburden and coal, and wind erosion of disturbed land all produce fugitive dust. The most common point sources of particulate matter are associated with coal crushing, storage, and handling facilities.

Gases that contain nitrogen and oxygen in varying amounts are referred to as nitrogen oxides, or NO_x. These are the primary fugitive gaseous emissions produced during surface coal mining operations. Nitrogen oxides are generated from tailpipe emissions from mining equipment and other vehicle traffic inside the mine permit area. Blasting to remove overburden can result in emissions of nitrogen dioxide (NO_2), because of the incomplete combustion of explosives used in the blasting process. The Buckskin Mine does not use cast blasting to move overburden, which is the most common source of blasting emissions. No NO_x point sources occur at the Buckskin Mine.

Non-mining air pollutant emission sources are also present within the region, though most (i.e., fugitive dust and tailpipe and exhaust emissions) are similar to those at the coal mines. Nitrogen oxides and sulfur dioxide are also generated at power-plants. The closest coal-fired power plants are the Wyodak, WYGEN, and Neil Simpson plants, located about 15 miles southeast of the general analysis area. The Dry Fork Station, a 420-megawatt, coal-fired power plant currently under construction, is located approximately 10 miles southeast of the area. The Buckskin Mine does not provide coal to any power plants in the PRB, and does not dispose of coal combustion by-products from local power plants in its backfill.

The current (since December 2006) EPA 24-hour air quality standard for $PM_{2.5}$ (particulate matter with a mean aerodynamic diameter of 2.5 microns or less) is 35 micrograms per cubic meter ($\mu g/m^3$), a reduction from the previous level of 65 $\mu g/m^3$. The current annual $PM_{2.5}$ standard is 15 $\mu g/m^3$. PM_{10} particulates have been monitored at the PRB mines since 1989. The current National Ambient Air Quality Standard (NAAQS) for 24-hour standard for PM_{10} particulates is 150 $\mu g/m^3$. The former Wyoming annual PM_{10} standard of 50 $\mu g/m^3$ was revoked during the EPA revisions of air quality standards in 2006. The NAAQS for annual NO_2 is 100 $\mu g/m^3$. This gas is not currently regulated at surface coal mines by either national or state ambient air quality standards, though the WDEQ does require an assessment of annual NO_x impacts as part of an air quality permitting analysis for new surface coal mines and existing mine plan revisions.

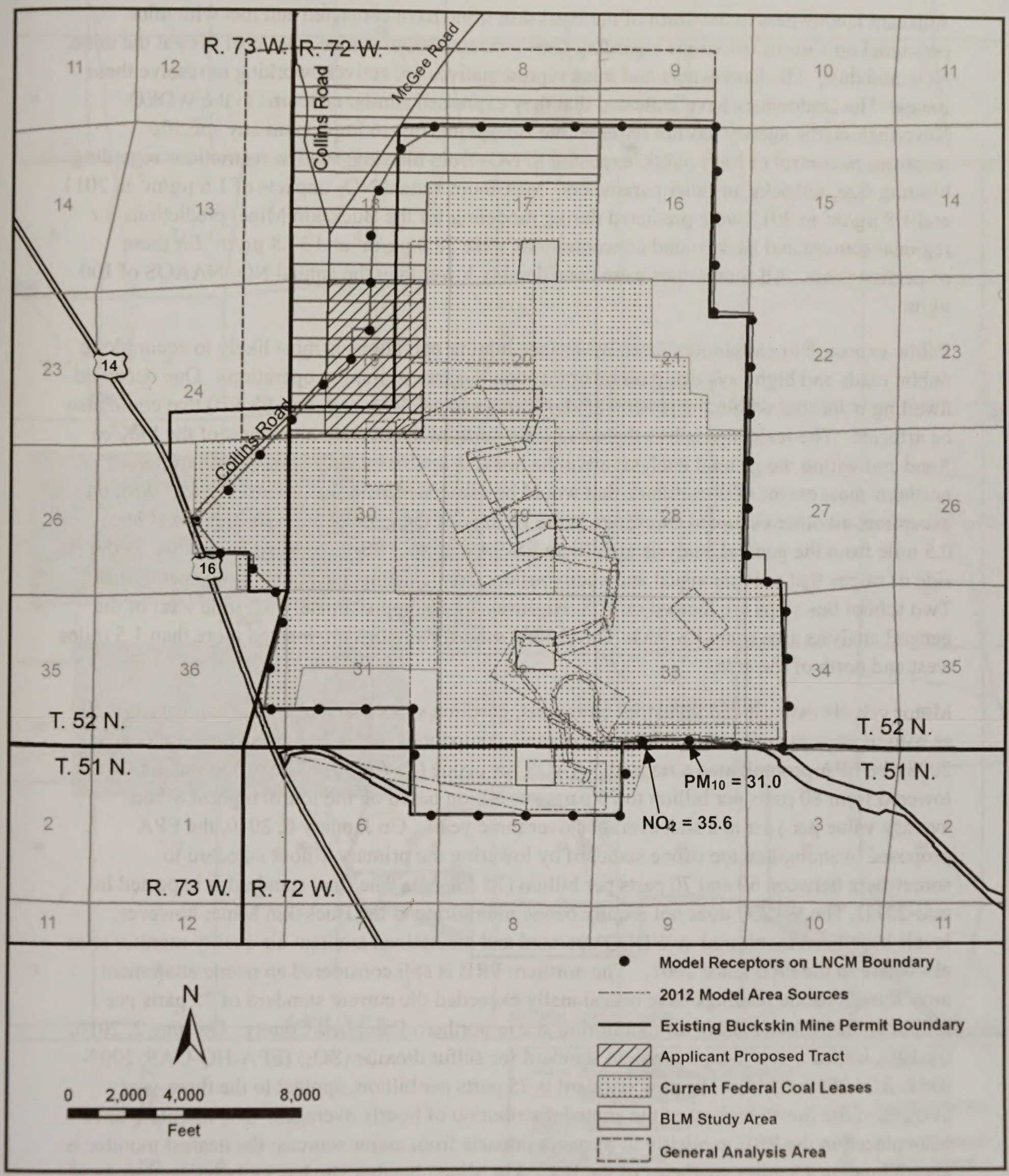
Moderate, short-term impacts on air quality are currently present at the Buckskin Mine because of existing mine operations. Long-term modeling for the current Buckskin Mine permit did not forecast any exceedances of the annual PM_{10} particulate NAAQS at the permitted production rate of 42 million tons per year; Buckskin's current and anticipated average annual production rate is 25 million tons per year. Results from the Buckskin Mine 24-hour PM_{10} monitors surpassed the 24-hour national annual average standard (150 $\mu g/m^3$) on only three occasions since monitoring began in 1989. Two of the three exceedances were deemed an "exceptional event" associated with strong winds by the WDEQ. In all three cases, the Buckskin Mine followed all mitigation and documentation procedures as required by the Natural Events Action Policy, including submitting detailed reports of the exceedance and accompanying meteorological conditions to the WDEQ. The dispersion model for the lands necessary to conduct mining at Buckskin (map ES-8A) showed a maximum PM_{10} concentration of 32.9 $\mu g/m^3$ in 2011, one of the two projected "worst-case" years used for the model. Map ES-8B shows the same modeling information for 2012. Both maps also depict the area sources used to model fugitive emissions.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map ES-8A

2011 Maximum Modeled PM_{10} and NO_2 Concentrations for Buckskin Mine Ambient Air Boundary



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

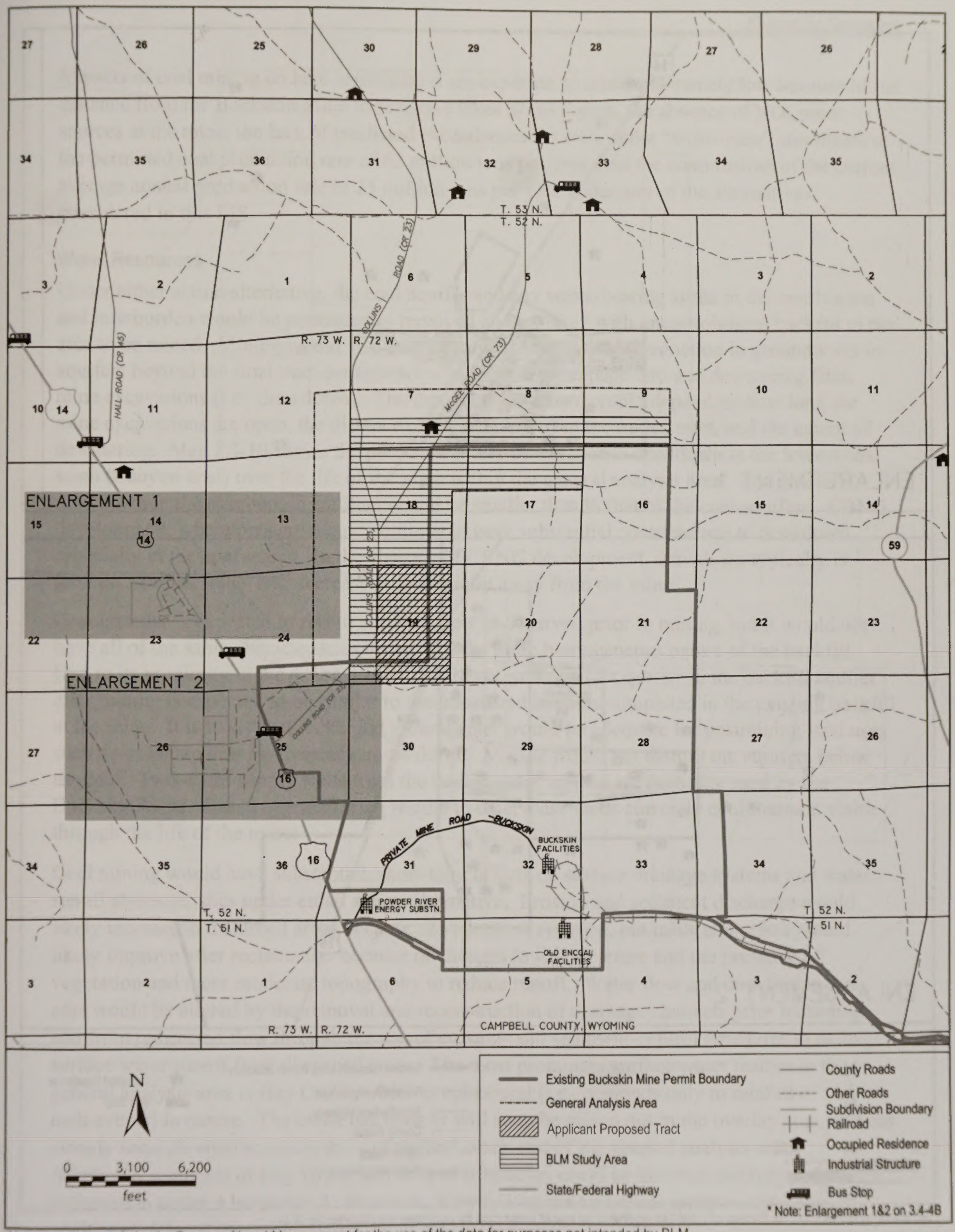
Map ES-8B

2012 Maximum Modeled PM_{10} and NO_2 Concentrations for Buckskin Mine Ambient Air Boundary

Adjacent landowners to the north of the Buckskin Mine have contacted and met with mine personnel on various occasions regarding their concerns about smoke from coal fires at the mine, NO_2, and dust. The landowners and mine representatives are actively working to resolve these issues. The landowners have indicated that they expressed similar concerns to the WDEQ. Nevertheless, the agency has not required the Buckskin Mine to implement any specific measures to control or limit public exposure to NO_2 from blasting, such as restrictions regarding blasting size, setbacks, or other parameters. Maximum annual NO_2 impacts of 1.6 $\mu g/m^3$ in 2011 and 1.8 $\mu g/m^3$ in 2012 were predicted during modeling for the Buckskin Mine; predictions for regional sources and background concentrations were 38.0 $\mu g/m^3$ and 37.8 $\mu g/m^3$ for these respective years. All four values were considerably lower than the annual NO_2 NAAQS of 100 $\mu g/m^3$.

Public exposure to emissions caused by surface mining operations is most likely to occur along public roads and highways that pass by or through the area of mining operations. One occupied dwelling is located within the general analysis area (map ES-9A and map ES-9B) that could also be affected. The residence is less than 0.25 mile north of the overlap area, west of the McGee Road and within the general analysis area; the home is approximately 1 mile north of the northern-most extent of disturbance that would be associated with the proposed tract. With one exception, all other occupied dwellings in the vicinity of the general analysis area are at least 0.5 mile from the general analysis area (map ES-9A and map ES-9B). Most homes are on the far side of ridges that provide visual and audio buffers from existing and future mine operations. Two school bus stops are located on U.S. Highway 14-16, approximately 0.5 mile west of the general analysis area (map ES-9A). Three other school bus stops are located more than 1.5 miles west and north of the area.

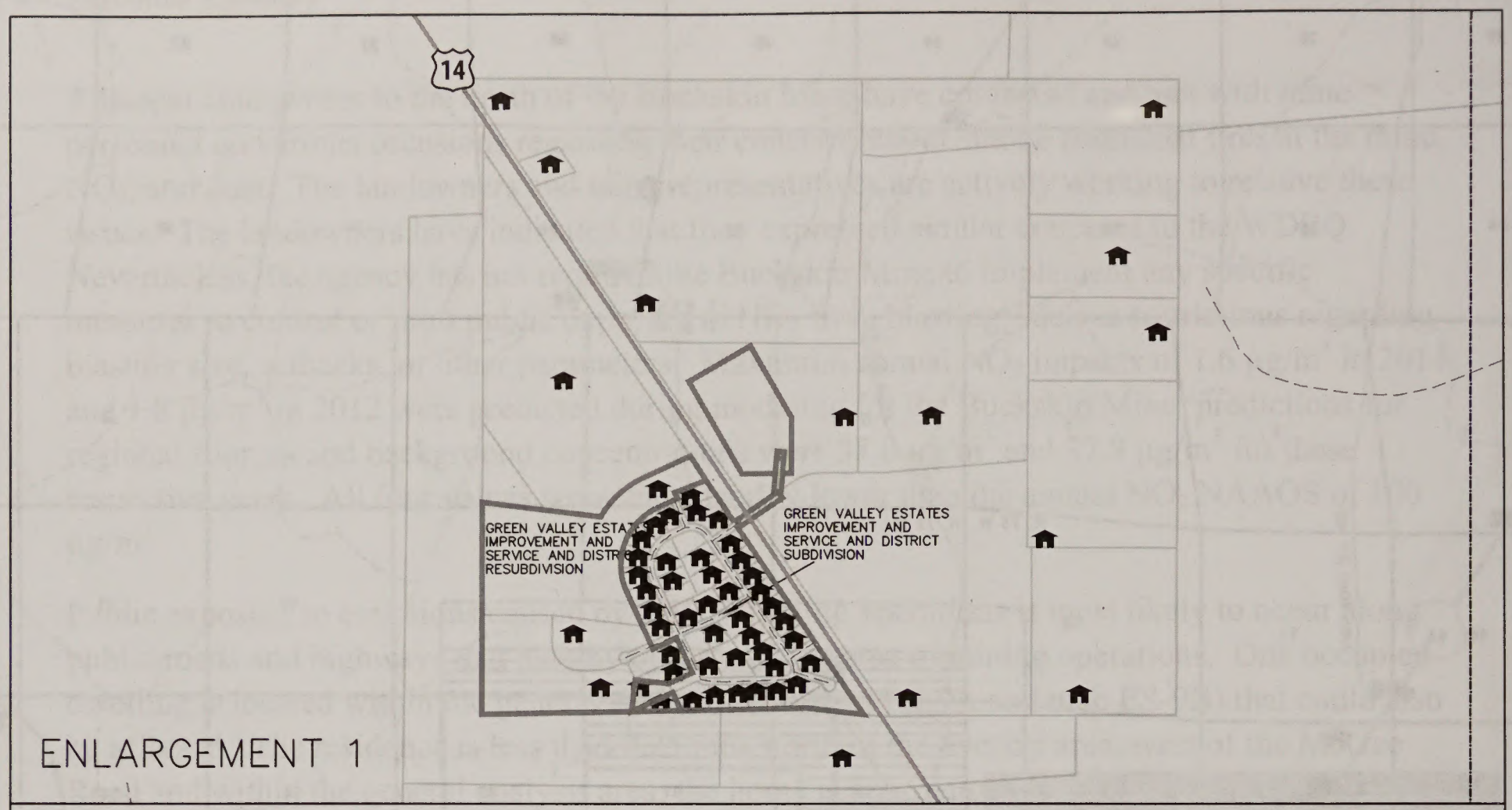
Motor vehicle exhaust and industrial emissions, gasoline vapors, and chemical solvents as well as natural sources emit NO_x and volatile organic compounds that help form ozone. In March 2008, the EPA promulgated a revised NAAQS for ozone (*75 FR 11*). The ozone standard was lowered from 80 parts per billion to 75 parts per billion based on the fourth highest 8-hour average value per year at a site, averaged over three years. On January 6, 2010, the EPA proposed to strengthen the ozone standard by lowering the primary 8-hour standard to somewhere between 60 and 70 parts per billion (*75 FR 11*). The final standard is expected in mid-2011. The WDEQ does not require ozone monitoring at the Buckskin Mine; however, levels have been monitored at WDEQ operated and maintained ambient air quality monitor sites elsewhere in the PRB since 2001. The northern PRB is still considered an ozone attainment area, though ozone readings have occasionally exceeded the current standard of 75 parts per billion at the Thunder Basin air monitoring site in northern Campbell County. On June 2, 2010, the EPA issued a new 1-hour ambient standard for sulfur dioxide (SO_2) (EPA-HQ-OAR-2007-0352, RIN 2060-A048). The new standard is 75 parts per billion, applied to the three-year average of the fourth highest of the annual distribution of hourly averages. SO_2 monitors have been placed in the PRB explicitly to measure impacts from major sources; the nearest monitor is approximately 15 miles southeast of the Buckskin Mine. Neither site has violated the new 1-hour standard of 75 parts per billion.

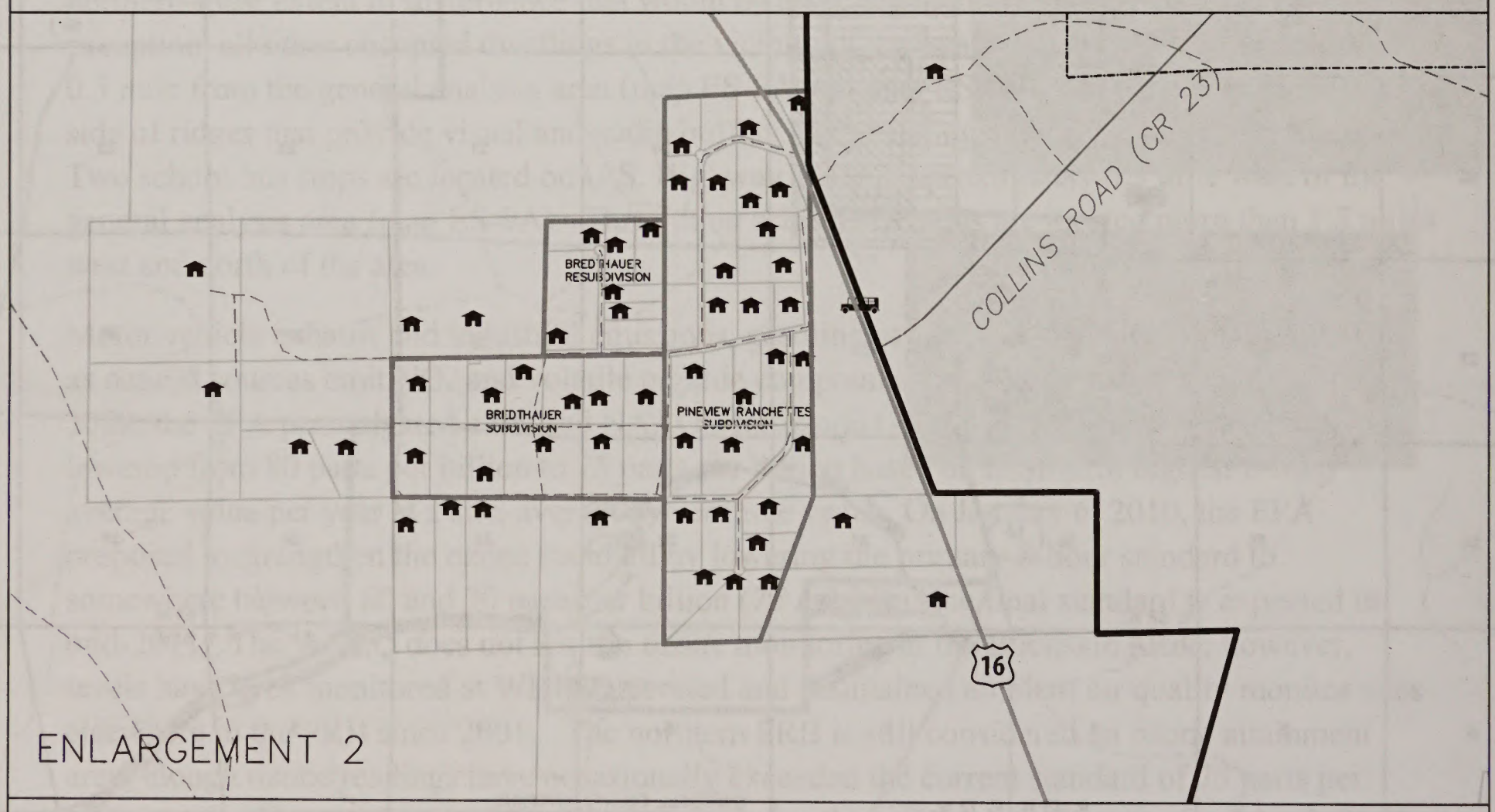


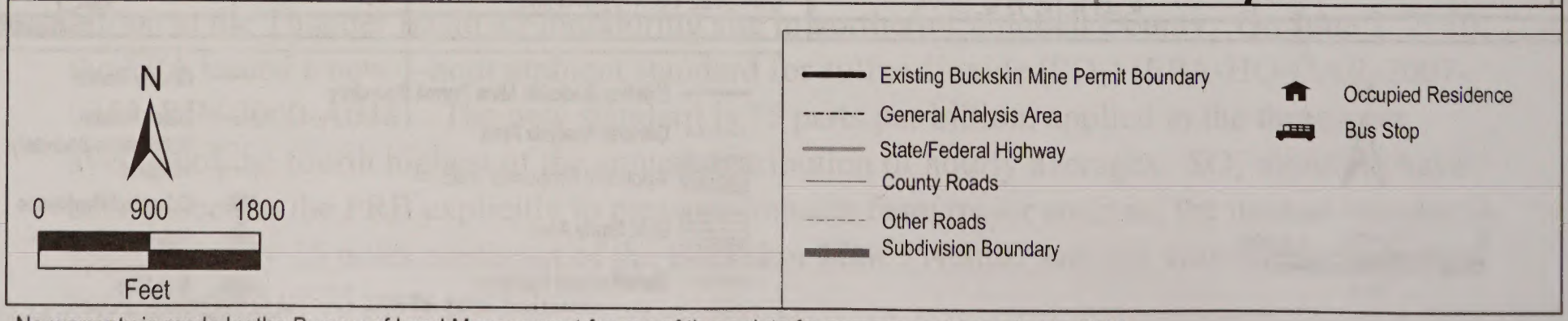
No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map ES-9A

Roads, Highways, Occupied Dwellings, Businesses, and School Bus Stops in the Vicinity of the General Analysis Area







No warranty is made by the Bureau of Land Management for use of these data for purposes not intended by BLM.

Map ES-9B

Enlargement—Roads, Highways, Occupied Dwellings, Businesses, and School Bus Stops in the Vicinity of the General Analysis Area

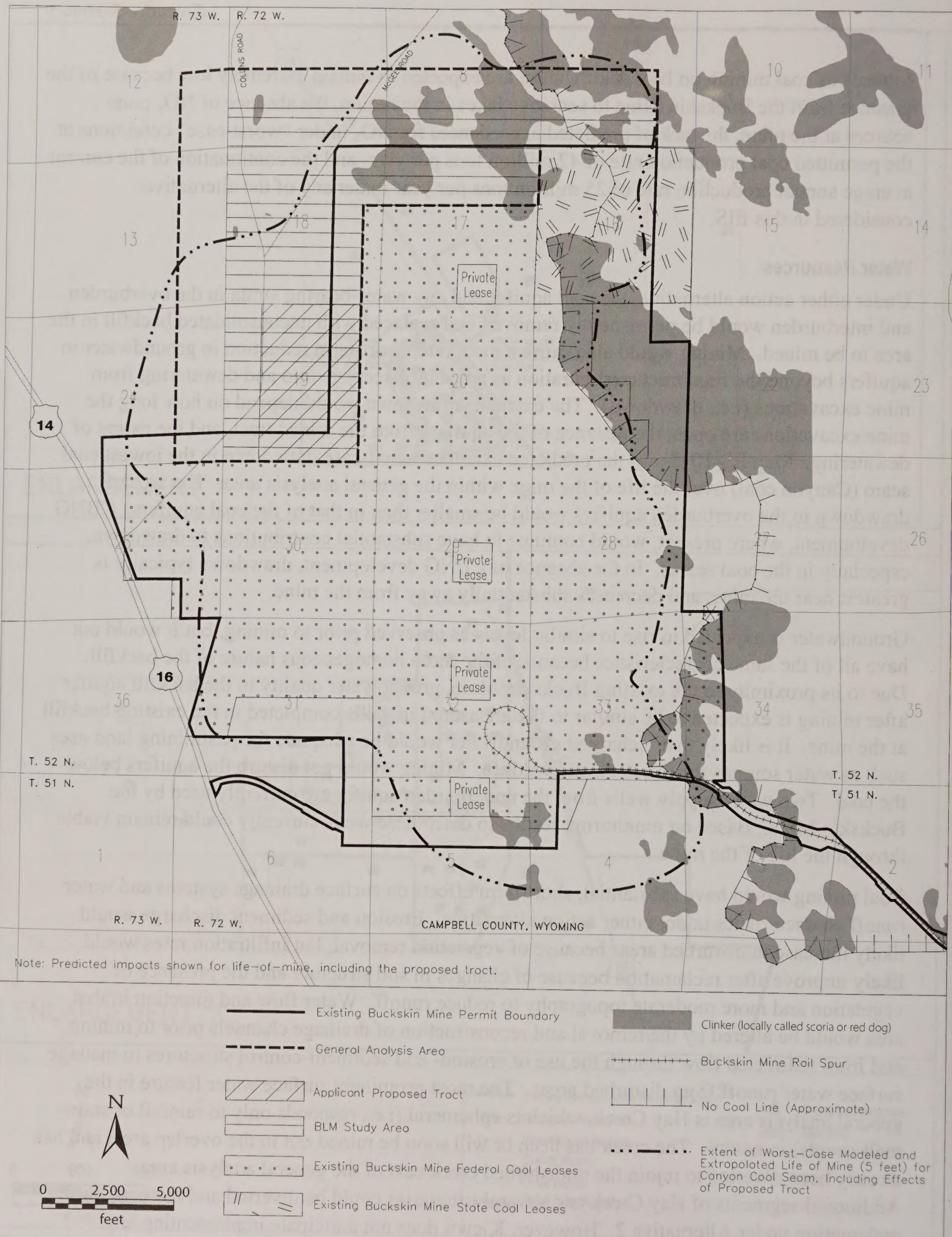
Impacts of coal mining on lake acidification are expected to remain extremely low because of the distance from the Buckskin Mine to sensitive lakes in the region, the absence of NO_x point sources at the mine, the lack of predicted exceedances for NO_x under "worst-case" conditions at the permitted coal production rate of 42 million tons per year, and the continuation of the current average annual production rate of 25 million tons per year under any of the alternatives considered in this EIS.

Water Resources

Under either action alternative, the coal aquifer and any water-bearing strata in the overburden and interburden would be permanently removed and replaced with unconsolidated backfill in the area to be mined. Mining would also cause a moderate, short-term reduction in groundwater in aquifers beyond the final tract configuration as a result of seepage into and dewatering from mine excavations (i.e., drawdown). The extent of drawdown would depend on how long the mine excavations are open, the distance of the aquifers from the mined tract, and the extent of dewatering. Map ES-10 shows the predicted extent of worst-case drawdown in the lowest coal seam (Canyon coal) over the life of the mine within the general analysis area. The area of drawdown in the overburden aquifers would be smaller than in that of the coal aquifers. CBNG development, where present, would continue to have substantial contributions to drawdown, especially in the coal seams. In the absence of CBNG development, drawdown typically is greatest near the mine, and decreases substantially away from the mine.

Groundwater is expected to rise to similar levels as observed prior to mining, but it would not have all of the same characteristics because of the more homogeneous nature of the backfill. Due to its proximity to the existing Buckskin Mine, groundwater quality in the backfill aquifer after mining is expected to be similar to that measured in wells completed in the existing backfill at the mine. It is likely that recharged groundwater would be adequate for postmining land uses such as water sources for livestock and wildlife. Mining would not disturb the aquifers below the coal. Two water supply wells from the underburden aquifer are currently used by the Buckskin Mine. Based on monitoring results to date, these wells currently could remain viable through the life of the mine.

Coal mining would have substantial, short-term effects on surface drainage systems and water runoff characteristics under either action alternative. Erosion and sediment discharge would likely increase in disturbed areas because of vegetation removal, but infiltration rates would likely improve after reclamation because of changes in soil structure and the presence of vegetation and more moderate topography to reduce runoff. Water flow and direction in that area would be altered by the removal and reconstruction of drainage channels prior to mining and from redirected flow through the use of erosion- and sediment-control structures to manage surface water runoff from disturbed areas. The most prominent surface water feature in the general analysis area is Hay Creek, which is ephemeral (i.e., responds only to rainfall or snow-melt events) in nature. The creek has been or will soon be mined out in the overlap area, and has already been diverted to rejoin the undisturbed creek east of the general analysis area. Additional segments of Hay Creek and several tributaries could be diverted and restored during reclamation under Alternative 2. However, Kiewit does not anticipate implementing any additional channel diversions under either action alternative.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map ES-10

Extent of Drawdown under Proposed Action

Both action alternatives would result in moderate, long-term impacts on groundwater rights for wells in coal or overburden aquifers until recharge. Effects would be similar for surface water rights. One surface water right on a disconnected drainage would be affected under the Proposed Action, while up to two surface water rights would be affected on disconnected drainages under Alternative 2.

Alluvial Valley Floors

The action alternatives considered in this EIS would not affect alluvial valley floors. Multiple investigations conducted within the general analysis area have concluded that the Hay Creek valley bottom is not an alluvial valley floor as defined by the WDEQ rules and regulations. No stream-laid deposits are present in the general analysis area. Runoff volume from 24-hour storm events in the vicinity of the Buckskin Mine is typically small relative to the cumulative storage capacity of reservoirs in the valley bottom and would not be sufficient to support any reliable flood irrigation practices.

Wetlands

Wetland inventories were based on U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) mapping (USFWS 2007) and a reconnaissance-level field visit throughout the general analysis area. Based on the NWI maps, approximately 64.44 acres of wetlands have been identified in the general analysis area. Of these, 30.7 acres were considered potentially jurisdictional wetlands based on field observations; the remaining 33.74 acres were confirmed to be nonjurisdictional non-wetlands (e.g., borrow pits, old impoundments) or were not found to be present during the field visit. Only the U.S. Army Corps of Engineers has the authorization to determine which wetlands are jurisdictional or nonjurisdictional.

Since the 2007 NWI-based wetland determination was completed, a portion of the general analysis area was formally delineated by wetland biologists. The results of this study are currently being reviewed by the Corps and the issuance of an approved jurisdictional determination is pending.

The specific functions (e.g., agriculture, livestock, and wildlife) of each identified wetland will be determined during the delineation associated with the permitting process for the final tract configuration, should a lease be issued, and are, therefore, not addressed in detail as part of the EIS analysis.

Under the Proposed Action, surface mining in the proposed tract and related activities in the support area and overlap area (associated with existing coal leases) would have a moderate, permanent impact on four small, potentially jurisdictional NWI-inventoried wetlands (1.21 total acres). Under Alternative 2, surface mining in the BLM study area and related activities in the support area and overlap area could have a moderate, permanent impact on five small, potentially jurisdictional NWI-inventoried wetlands (1.89 total acres). The greatest single acreage of a potentially jurisdictional NWI-inventoried wetland is west of one or both county roads in the area considered operationally limited by Kiewit; Kiewit does not anticipate relocating either road to access coal reserves. All wetland functions at affected sites would be lost during mining and

support activities. Any impacts would be mitigated during reclamation by creating equivalent acreages of wetlands elsewhere in the Buckskin Mine permit area to ensure no net loss of wetland function in the general analysis area. No additional reaches of Hay Creek would be diverted under either action alternative.

Soil Resources

Five soil formation processes causing different soil types were described in the general analysis area. Soil types and depths in that area are similar to soils currently being salvaged and used for reclamation at the Buckskin Mine and other nearby mines in northern Campbell County.

Surface mining would have a moderate, long-term effect on soil resources in 1,134 acres under the Proposed Action and up to 2,847 acres under Alternative 2. Mining in the general analysis area would have a moderate, short- to long-term impact on the physical, biological, and chemical properties of stockpiled soils prior to reclamation. Following reclamation, the action alternatives would have a moderate, beneficial, long-term effect on replaced soils. Such soils would be more uniform in type, thickness, and texture, and would have a more uniform soil chemistry and soil nutrient distribution. Runoff would be decreased and infiltration rates would gradually return to premining levels. Sediment-control measures would be implemented where runoff does occur to preserve reclaimed materials. Average topsoil quality would be improved because soil material that is not suitable to support plant growth would not be salvaged for use in reclamation. The replaced soil would support a stable and productive vegetation community adequate in quality and quantity to support the planned postmining land uses (i.e., wildlife habitat and livestock grazing).

Vegetation Resources

Eight distinct vegetation communities and four additional categories were identified and mapped in the general analysis area. The proposed tract is dominated (71%) by a variety of common species of upland grasslands; the general analysis area is dominated (71%) by upland grasslands (approximately 40%, combined) and agricultural lands (crops, hay fields, and pastures; approximately 31%). Sagebrush comprises less than 11% of both the proposed tract and the general analysis area.

Under either action alternative, active mining and support activities would have a moderate, short-term impact on vegetation. Vegetation would be incrementally removed to accommodate mining. Effects would be greatest on upland grasslands and agricultural lands. Under the Proposed Action, approximately 126 non-contiguous acres of sagebrush would be affected in the proposed tract, support area, and remainder of the overlap area. Under Alternative 2, up to 302 non-contiguous acres of sagebrush would be affected in the BLM study area, support area, and remainder of the overlap area. Average patch size for sagebrush in those areas is 4.9 acres.

Impacts associated with the removal of vegetation could include increased soil erosion and differences between premining and postmining vegetative communities. Reclamation, including revegetation, will immediately follow as mining progresses through the area. Estimates of the time elapsed from topsoil stripping through reseeding of any given area range from two to

five years; that time-frame would be considerably longer for areas occupied by mine-related facilities and infrastructure.

Reestablished vegetation would be dominated by species mandated in the reclamation seed mixtures, which are approved by the WDEQ. The majority of these species would be native to the general analysis area. Erosion will be monitored to determine if corrective action is needed during establishment of vegetation. Controlled grazing will be used during revegetation as a management tool and to determine the suitability of the reclaimed land for postmining land uses. Any decrease in plant diversity would not seriously affect the potential productivity of the reclaimed areas, and the proposed postmining land use (wildlife habitat and rangeland) should be achieved even with the changes in vegetation composition and diversity.

Wildlife Resources

Both action alternatives would have a minor to moderate, short-term impact on most wildlife species present in the general analysis area, with longer effects to wildlife habitats. Impacts could include: injuries or mortalities causes by mine-related traffic; direct losses of less mobile wildlife species; restrictions on wildlife movement created by fences, spoil piles and pits; displacement of wildlife from existing habitat in areas of active mining (including abandonment of nests or nesting and breeding habitat for birds); loss of nesting and foraging habitat; increased competition between animals in areas adjacent to mining operations; and increased noise, dust, and human presence. Habitat disturbance would be incremental through the general analysis area, with reclamation progressing as new disturbance occurs.

The Hay Creek II general analysis area is not included in or within several miles of either a state sage-grouse core breeding area or connectivity area, as defined by the Governor of Wyoming's Sage-Grouse Implementation Team (Office of the Governor of Wyoming 2008), or BLM sage-grouse focus area. No greater sage-grouse leks would be physically affected by either action alternative. The nearest sage-grouse lek (Hay Creek) is within the existing permit area approximately 0.5 mile to the southeast of the general analysis area and, thus, is already subject to disturbance from previously permitted activities. The McGee sage-grouse lek is on private surface approximately 1.25 miles north of the general analysis area. That site is on the far side of multiple ridges that provide a visual and audio buffer, and it is not likely to be affected by mine operations. The Daly sage-grouse lek is approximately 1.75 miles southwest of the general analysis area. That lek has been inactive for the last 17 consecutive years, though two adult males were seen approximately 1,000 feet from the lek on one occasion in 2002; the Daly lek has been classified as abandoned by the WGFD (2006). Sage-grouse were last observed at the Hay Creek lek in 2001 and the McGee lek in 2004; both are considered occupied by the WGFD (2006).

Two occupied sharp-tailed grouse leks occur within the general analysis area. The McGee II lek is in the overlap area with the current permit area and the McGee III lek is immediately north of the overlap area (Alternative 2). Due to their locations, those leks have been or would be disturbed by previously permitted mining of existing leases. The McGee I sharp-tailed grouse lek is approximately 0.25 mile north of the general analysis area. It would not be in view of the

general analysis area because of the ridgeline that separates the two sites, but it could be affected by noise from within the general analysis area. The Stickel lek is approximately 0.75 mile southeast of the general analysis area and within the existing permit area; this site has been or would be disturbed by previously permitted activities on existing leases. Sharp-tailed grouse were last recorded at the McGee II lek in 2004 and the McGee III lek in 2005. The McGee I lek was last active in 2001, and the Stickel lek in 2002.

As described previously, the prevalence of upland grasslands and the limited presence of surface water reduce the area's value to sagebrush obligates such as the sage-grouse. No grouse nests or broods for either species have been recorded in the general analysis area during targeted surveys or incidental to surveys for other species. No sage-grouse have been observed during winter, though site visits occur less often at that time of year. No sharp-tailed grouse have ever been observed on the proposed tract during any season, though flocks of as many as a dozen birds have infrequently been recorded in the general analysis area, feeding in fallow agricultural fields and perched in the tree shelterbelt near the junction of the Collins and McGee roads in winter. No sharp-tailed grouse have been seen in those locations since at least 2003.

The general analysis area does not include any unique or crucial big game habitat, and no elk or white-tailed deer are present there. No bald eagle nests or winter roosts have ever been documented in the general analysis area or surrounding lands; sightings of this species in the vicinity of the general analysis area have averaged less than one bird per winter over the last 26 years (1984–2009).

Little (less than 1% of the total area) aquatic habitat is present in the general analysis area, so few aquatic species would be lost during mining operations. Indirect impacts are longer-term and include alterations in topography and vegetative cover following mining and reclamation, which may decrease wildlife carrying capacity and habitat diversity. Because the general analysis area is dominated (71% combined) by upland grassland communities and agricultural lands, the establishment of reclaimed grassland communities after mining has been completed would represent similar or somewhat improved habitats for most wildlife species compared to those in the premining landscape.

No mountain plovers have ever been documented in the vicinity of the general analysis area during that period. Additionally, typical suitable habitat (short and sparse vegetation) for this species is not present in the area. None of the 18 migratory bird species of management concern for Wyoming coal mines that have historically been observed in the vicinity are regularly seen in the general analysis area. The upland grasslands and agricultural lands that dominate the area lack the specific characteristics (shrubs, wetlands, prairie dog colonies, or shorter, less dense grasses) typically associated with the species of greatest concern.

Up to three intact raptor nests could be affected in the general analysis area. Due to their respective locations and histories, only one of the three intact nests is likely to be affected by future mining operations under either action alternative. That nest is in a tree grove in the overlap area and, thus, is already subject to disturbance from previously permitted mine operations. All appropriate mitigation measures will be taken for that nest, in keeping with the

current USFWS-approved monitoring and mitigation plan; the plan would be updated prior to the permitting process and before any new surface associated with either alternative is disturbed.

In the long term, following reclamation, wildlife habitat diversity may be somewhat reduced because of gentler topography, less diverse vegetative cover, and reduction in sagebrush density. However, sagebrush comprises less than 11% of the general analysis area, so impacts on sagebrush-obligates would be reduced. Efforts have been initiated in recent years by mining companies to increase the diversity of postmine topography and to increase the amount of sagebrush in the reclamation, as appropriate.

Threatened and Endangered Species

The action alternatives discussed in this EIS will have no effect on threatened and endangered plant and animal species. Two federally listed plant species occur in Campbell County: the Ute ladies'-tresses (threatened) and blow-out penstemon (endangered). Areas of suitable habitat for the Ute ladies'-tresses within the general analysis area were surveyed during the appropriate survey window in August 2004 and annually from 2006 through 2009; no individuals were located. Surveys conducted for potential blowout penstemon habitat in the general analysis area in 2008 and 2009 confirmed that no suitable habitat for this species is present in the area. In addition, the general analysis area is not located within the documented historical range of the blowout penstemon in Wyoming, which is located approximately 170 miles northwest of the known Nebraska sites and approximately 225 miles northeast of the Wyoming occurrences.

On March 5, 2010, the USFWS issued a determination that listing the greater sage-grouse under the Endangered Species Act was "warranted, but precluded" by other higher priorities. Although the sage-grouse continues to be managed by the WGFD, its current status as a candidate species under the Endangered Species Act gives further impetus to ongoing annual monitoring efforts. On May 11, 2011, after a thorough review of all available scientific and commercial information, the USFWS determined that the mountain plover is not threatened or endangered throughout all or a significant portion of its range, including the Hay Creek II general analysis area and the rest of Campbell County, Wyoming (76 FR 92). The black-footed ferret has been removed from the list of threatened and endangered species for Campbell County, but remains on the national list for such species. The ferret is a nocturnal mammal that depends almost entirely upon the prairie dog for its survival. No black-footed ferrets have ever been documented at the Buckskin Mine or in the surrounding region, and no black-tailed prairie dog colonies (potential ferret habitat) are present within the general analysis area.

Land Use and Recreation

The entire surface of the existing Buckskin Mine permit area and general analysis area is privately owned by individuals or companies. All of the coal reserves in the proposed tract and BLM study area are federally owned, whereas the remaining subsurface minerals (i.e., oil and gas reserves) are under a mixture of private and federal ownership. Wildlife habitat and livestock grazing are the primary present and historical land uses in the general analysis area. Secondary land uses include pastureland (ranching), dryland cropland, transportation, and CBNG development. Coal mining at the Buckskin Mine is and has been the dominant land use to the

east and south of the general analysis area since the mid 1980s. No conventional oil and gas wells are located in the general analysis area.

Under both action alternatives, active mining would have a moderate, short-term impact on most other land uses, with a long-term impact on some wildlife habitats. Grazing uses of the general analysis area would be more limited in disturbance areas during mining, though grazing is used as a management tool in reclaimed areas. Oil and gas development would be curtailed and CBNG that is not recovered prior to mining would be irretrievably lost as the coal is removed. Due to the lack of public lands, opportunities for recreational use and public grazing would not be affected. Existing coal and transportation activities, infrastructure, and facilities would remain in the area; coal production and transportation would continue at their current rates. Kiewit does not anticipate relocating any roads or securing occupied residences to access new federal coal reserves. Livestock and wildlife use is expected to increase once mined areas are fully reclaimed.

Cultural Resources

The entire general analysis area has been reviewed for previous cultural surveys through a files search and inventoried for cultural resources at a Class III level in the field. Of the 14 sites identified in that area, 6 are prehistoric and 8 are historic (Newberry 2008). Historic site categories documented in the general analysis area fall under the context of rural settlement. Specifically, the historic sites in the general analysis area are associated with homesteading and stock-raising circa the 1910s to the 1940s. All prehistoric and historic sites are determined not eligible for inclusion in the National Register of Historic Places. No further protection is afforded these sites and no further work is required.

No sites of Native American religious or cultural importance have been identified in the general analysis area. Appropriate action must be taken to address concerns related to any cultural or Native American sites identified at a later date.

Visual Resources

Mining would affect landscapes classified by the BLM as visual resource management Class IV; the overall natural scenic quality of that class rating is considered relatively low. Impacts of coal mining on visibility in the general analysis area would be minor and short-term. Mining activities would be visible from U.S. Highway 14-16 and two county roads (the Collins and McGee roads), though the extent and duration of visibility would vary under each action alternative. No unique visual resources have been identified in or near the general analysis area, and the landscape character would not be significantly changed following reclamation. Current mining activities (blasting procedures and sizes, coal haul rates and distances, dust suppression, etc.) at the Buckskin Mine would not change if the proposed tract or an alternative configuration is leased. Current best available control technology measures for particulates that could contribute to impaired visibility would continue to be employed.

Noise

One occupied residence is located within the general analysis area, less than 0.25 mile north of the overlap area. This residence is in direct line-of-sight of the current mine pit and associated support activities. Mine-related noise under the action alternatives would have a minor to substantial, short-term impact on this residence, depending on the final tract configuration. Most occupied dwellings are located in one of three housing developments west of the existing permit area and on the far side of Highway 14-16. Those residences are currently closer to the existing permit area than they would be to new mining under either action alternative. The high rolling terrain between most residences and the general analysis area provides a visual and audio buffer from current and future mine operations. Additionally, the increase in noise levels would not be considered a significant noise impact because the rate of mining would not change and the western limit of expansion of the mine would be constrained because of the required setbacks at the Collins Road and U.S. Highway 14-16.

Noise levels in wildlife habitat adjacent to the expansion area might increase, but anecdotal observations indicate wildlife can adapt to mine noise, especially since similar mining operations have been conducted in the area for many years. No increase in average daily railroad traffic or railroad noise would occur under any of the alternatives analyzed.

Transportation

Transportation facilities in and near the general analysis area include a federal highway, a state highway, two gravel county roads, various unimproved local and access roads; the improved Buckskin Mine access road; the Buckskin Mine rail spur; oil and gas pipelines; electric corridors; and associated rights-of-way.

Under the Proposed Action, surface coal mining in the proposed tract could impact one public roadway, three overhead power lines, four existing oil and gas pipelines, and one potential new oil and gas easement; impacts would be minor to moderate, and short-term. Under Alternative 2, mining could have similar impacts on two public roadways, eight overhead power lines, six existing oil and gas pipelines, and one potential new oil and gas easement. Most of the power lines in the vicinity are associated with on-going mine operations. No rail lines would be affected under either action alternative. Temporary surface disturbance from mine support activities (e.g., topsoil stripping, soil stockpiling) in the combined buffer area could affect one additional power line and three additional pipelines.

Existing road and rail infrastructure would remain in place, though the rate of road and rail use is not expected to increase during that period. Two public roads (the Collins and McGee roads) are located within the general analysis area. Lands within 100 feet of the outside edge of the right-of-way of a public road are considered unsuitable for mining; however, they could be included in the final tract configuration to allow for maximum recovery of all the minable coal adjacent to the 100-foot buffer zones. Active pipelines and utility/power lines would have to be relocated in accordance with previous agreements, or agreements would have to be negotiated for their removal or relocation.

Hazardous and Solid Waste

Potential sources of hazardous or solid waste could include spilled, leaked, or dumped substances, petroleum products, and solid waste associated with coal and oil and gas exploration, oil and gas development, utility line installation and maintenance, or agricultural activities. No such hazardous or solid wastes are known to be present in the general analysis area.

Impacts associated with hazardous waste would be negligible and short-term. Hazardous and solid wastes generated in the course of mining the proposed tract would be similar to those currently being created by existing mining operations,. Wastes generated by mining the proposed tract would be handled in accordance with the existing regulations using the procedures currently in use, and in accordance with WDEQ-approved waste disposal plans at the Buckskin Mine

Socioeconomics

Both action alternatives would have negligible, beneficial, short-term impacts on local employment. The Buckskin Mine anticipates hiring a few additional employees to meet existing staffing needs, but no new hires are expected to occur as a result of a new coal leasing action. Impacts on federal and state revenues would be substantial and beneficial under both action alternatives. The potential additional federal revenue from the general analysis area would range from approximately $69 to $241 million, depending on the alternative selected and the bonus price when the coal is leased. The potential additional revenue to the state of Wyoming from the general analysis area would range from $91 to $300 million, depending on the alternative selected, the bonus price when the coal is leased, and the selling price of the coal. Because average annual coal production rates would not increase, no new employees would be hired as a direct result of a leasing action and therefore no new impacts on the local housing market or increased demands on the existing community facilities or services in the county would occur though existing demands on infrastructure could be extended by up to six years.

Environmental Justice

Economic and demographic data indicate that neither minority populations nor people living at or below the poverty level comprise a "meaningfully greater increment" of the total population in Gillette or Campbell County than they do in the state as a whole. Also, the Native American population is smaller than in the state as a whole and no known Native American sacred sites are present in or near the general analysis area.

Greenhouse Gas Emissions

The annual equivalent carbon dioxide (CO_2e) emissions at the Buckskin Mine are not expected to increase under either action alternative. The maximum annual coal production would not be affected; average strip ratios and haul distances would be substantially equivalent to those already encountered at the mine. Conversely, projected CO_2e emissions over the life of the mine would increase under either action alternative. Although annual average production is not expected to increase, the additional federal coal reserves would extend the mine life by approximately two years under the Proposed Action and up to six years under Alternative 2,

which would also extend the period for associated CO_2e emissions. Methane emissions from Wyoming's coal mines in 2010 are projected to be 2.3 million metric tons of CO_2e (Center for Climate Strategies 2007), of which the Buckskin Mine's 2008 methane emissions represent 3.4%.

Carbon Sequestration

Carbon sequestration, the process of carbon capture, separation, and storage or reuse, is being researched as a means to stabilize and reduce concentrations of carbon dioxide (CO_2), a greenhouse gas. Direct options for carbon sequestration would involve means to capture CO_2 at the source (e.g., power plant) before it enters the atmosphere coupled with "value-added" sequestration (e.g., use of captured CO_2 in enhanced oil recovery operations). Indirect sequestration would involve means of integrating fossil fuel production and use with terrestrial sequestration and enhanced ocean storage of carbon (U.S. Department of Energy 2007). The PRB has geologic formations and producing oil and gas reservoirs that are potential target candidates for both enhanced oil recovery and/or deep geologic sequestration. The current limiting factor is the lack of pipeline infrastructure and economic feasibility for CO_2 transmission and use. No geologic carbon sequestration projects currently exist or are currently planned in the PRB at this time.

Mitigation

The Buckskin Mine's currently approved mining permit includes extensive baseline information, ongoing monitoring information and commitments, and mitigation measures that are required by the SMCRA and Wyoming State Law. Compliance, mitigation, and monitoring measures that are required by regulation are considered to be part of the Proposed Action and Alternative 2 considered in this EIS. These regulatory requirements, mitigation measures, and monitoring commitments are in place for the No Action Alternative as part of the currently approved mining and reclamation plan for the mine and would be updated prior to the permitting process that would be required to mine the final tract configuration.

If impacts are identified during the leasing process that are not mitigated by existing required mitigation measures, the BLM can include additional mitigation measures, in the form of stipulations on a new lease, within the limits of its regulatory authority. Any special stipulations identified by the BLM where additional or increased monitoring measures are recommended to be added to the BLM leases are included in appendix D of the EIS.

Cumulative Impacts

Cumulative impacts result from the incremental impacts of an action added to other past, present, and reasonably foreseeable future actions, regardless of who is responsible for such actions. Cumulative impacts can result from individually minor, but collectively significant, actions occurring over time.

Since decertification of the Powder River Federal Coal Region in 1990, 22 federal coal leases containing more than 6.1 billion tons of federal coal have been issued following competitive sealed-bid sales. Three exchanges of federal coal in the Wyoming portion of the Powder River Federal Coal Region have also been completed. Eleven additional coal lease applications, including the Hay Creek II coal lease application, are currently pending. The pending LBA applications contain over 3.3 billion tons of coal.

Currently, the BLM is completing a regional technical study, called the PRB Coal Review, to help evaluate the cumulative impacts of coal and other mineral development in the PRB. The study evaluates current conditions as of a baseline year (2002, 2003, or 2004) and projects development levels and potential associated cumulative impacts related to coal and coal-related development, oil and gas and related development, and other development through 2020. Due to variables associated with future coal production, two projected coal production scenarios (representing an upper and a lower production level) were developed. The projected development levels are based on projected demand and coal market forecasts and include production at the Buckskin Mine during the baseline year and projected production for 2010, 2015, and 2020.

The Wyoming portion of the PRB is the primary focus of the PRB Coal Review, but the Montana portion of the PRB is included in some studies. Results for those PRB Coal Review studies that have been completed are summarized in chapter 4.0 of the EIS. The remaining studies will be incorporated into the final report as they become available.

Cumulative impacts vary by resource, with potential impacts on air quality, groundwater quantity, wildlife habitat, and socioeconomics generally representing the greatest concerns.

The original PRB Coal Review air quality study documented the modeled air quality impact of existing operations during a baseline year, 2002, and of projected development activities in 2010. The BLM updated the model in 2008 and conducted the cumulative air quality impact analysis using a revised baseline year of 2004 with development levels projected for year 2015; that analysis was included in the draft EIS. After the draft EIS was issued, modeling of cumulative air quality effects for 2020 was completed; data and analyses for both model years are reflected in this final EIS. The EPA guideline CALPUFF model system version 5.8 (Scire et al. 1999a) was used for the modeling analysis. The revised baseline year emissions inventory was developed using 2004 actual emissions data or emissions estimates and has incorporated the recent analyses of emissions in Wyoming and Montana, which were not available when the 2010 modeling study was done. The impacts for the baseline year (2004) and for 2015 and 2020 lower and upper coal production scenarios were directly modeled.

The PRB Coal Review generally considers existing regional air quality conditions in the targeted study areas to be very good. There are limited air pollution emissions sources (few industrial facilities, including the surface coal mines, and few residential emissions in relatively small communities and isolated ranches) and good atmospheric dispersion conditions. The available data show that the region complies with the ambient air quality standards for NO_2 and SO_2. There have been no monitored exceedances of the annual PM_{10} standard in the Wyoming PRB. Table ES-2 presents the maximum modeled impacts on ambient air quality at the near-field

receptors in Wyoming and Montana. Results shown represent the maximum impact at any point in each receptor group; data are provided for the baseline year (2004) analysis and for both coal production scenarios for 2015 and 2020. Peak impacts occur at isolated receptors and are likely due to unique source-receptor relationships. The model results should not be construed as predicting an actual exceedance of any standard, but are at best indicators of potential impacts.

Table ES-3 lists provides a detailed listing of visibility impacts for all analyzed Class I and sensitive Class II areas. For the upper and lower coal production scenarios, it shows the number of additional days that the projected impacts were greater than 1.0 deciview (10% change in light extinction) for each site in each modeled year.

The PRB Coal Review provides an assessment of the cumulative impact on surface and groundwater resources associated with future projected levels of coal mining, coal mine dewatering, CBNG groundwater withdrawal and surface disposal, and coal mine and conventional oil and gas surface disposal of groundwater. Updated Coal Review studies describe the baseline year (2002) ground and surface water resource conditions in the study area, which includes the Hay Creek II area and the rest of Campbell County. The reports present potential future cumulative groundwater impacts in the area of CBNG development and coal mine expansion in the eastern PRB. They also provide a cumulative impact assessment of modeled changes in surface water quality as a result of CBNG, conventional oil and gas, and surface coal mining development projected for 2010, 2015, and 2020 (base year of 2003) in the eastern PRB within approximately 25 miles of the coal mines. A stream channel stability analysis was also conducted to evaluate the potential effects to stream channels because of projected CBNG production water discharge.

A number of modeling analyses have previously been conducted to help predict the impacts of surface coal mining on groundwater resources in the PRB. In addition, each mine must monitor groundwater levels in the coal and underlying and overlying aquifers and assess the probable hydrologic consequences of mining as part of the mine permitting process. Extending the life of the Buckskin Mine by issuing a new lease would result in additional water being withdrawn from the subcoal Fort Union Formation, but no new subcoal water supply wells would be required. The additional water withdrawal would not be expected to extend the area of water level drawdown over a substantially larger area because of the discontinuous nature of the sands in the Tullock Member and the fact that drawdown and yield reach equilibrium in a well because of recharge effects. Because of the distances separating subcoal Fort Union Formation wells used for mine water supply, these wells have not experienced interference and are not likely to in the future.

Table ES-2. Projected Maximum Potential Near-Field Impacts (µg/m³)

Pollutant	Averaging Time	Base Year (2004) Impacts	2015 Lower Coal Development Scenario Impacts	2015 Upper Coal Development Scenario Impacts	2020 Lower Coal Development Scenario Impacts	2020 Upper Coal Development Scenario Impacts	National AAQS	Wyoming AAQS	Montana AAQS	PSD Class II Increments
Wyoming Near-Field										
NO_2	Annual	31.3	46.7 47.4	30.5	30.6		100	100	—[a] 25	
SO_2	Annual	15.3	16.2 16.2	16.4	16.5		80	60	—	20
	24-hour	112.3	119.6 119.	6 143.	3 143.	3	365	260	—	91
	3-hour	462.0	814.1 814.	1 936.	7 936.	7	1,300	1,300	—	512
$PM_{2.5}$ Annu	al	13.4	**18.7**	**21.4**	**16.3**	**16.3**	15	15 — —		
24-h	our	**87.6**	**179.5**	**179.5**	**218.4**	**218.4**	35	35 — —		
PM_{10} Annu	al	38.4	**53.5**	**61.0**	46.6 46.6		—	50[b] —		17
24-h	our	**250.4**	**512.8**	**512.9**	**624.1**	**624.3**	150 150		—	30
Montana Near-Field										
NO_2	Annual	3.3	6.5 6.5	2.5	2.6		100	—	100	25
1-ho	ur	**409.0**	**826.3**	**826.4**	**440.1**	**442.7**	188.1 —		564	—
SO_2	Annual	1.6	1.7 1.7	3.0	3.1		80	—	80	20
	24-hour	16.1	16.5 16.6	24.7	27.1		365	—	365	91
3-ho	ur	65.0	66.5	66.5	138.9	138.9	1,300	—	1,300	512
	1-hour	162.9	166.6 166.	6 237.	0 259.	1	—	—	1,300	—
$PM_{2.5}$	Annual	1.0	1.8 1.9	0.9	0.9		15	—	15	—
	24-hour	10.2	15.4 20.6	10.2	10.2		35	—	35	—
PM_{10}	Annual	2.8	5.2 5.3	2.5	2.6		—	—	50	17
	24-hour	29.1	44.0 58.5	29.3	29.3		150	—	150	30

µg/m³ = microgram per cubic meter; AAQS = Ambient Air Quality Standards; PSD = prevention of significant deterioration; NO = nitrogen oxide; SO_2 = sulfur dioxide; PM_{10} = particulate matter measuring 10 microns or less in diameter; $PM_{2.5}$ = particulate matter measuring 2.5 microns or less in diameter

[a] No standard or increment.

[b] The EPA has revoked the NAAQS annual PM_{10} standard of 50 µg/m³, but that standard is still effective for Wyoming until it enters into rulemaking to revise the state AAQS.

Bold values indicate projected exceedance of national and/or state ambient air quality standards.

Source: 2009 update to the Task 3A Report (BLM 2009c).

Table ES-3. Modeled Change in Visibility Impacts at Class I and Sensitive Class II Areas

Location	Base Year (2004)	Coal Development Scenario			
		2015 Lower	2015 Upper	2020 Lower	2020 Upper
	No. of Days >10% Change in Visibility	Change in No. of Days >10% in visibility			
Class I Areas[a]					
Badlands National Park	218	26 26	44	44	
Bob Marshall Wilderness Area	8	0 0 0 0			
Bridger Wilderness Area	144	2 2 5 5			
Fitzpatrick Wilderness Area	91	2 2 6 6			
Fort Peck Indian Reservation	105	10	10	20	21
Gates of the Mountain Wilderness Area	55	0	0	4	4
Grand Teton National Park	70	2	2	6	6
North Absaroka Wilderness Area	61	3	3	8	8
North Cheyenne Indian Reservation	243	32	47	59	60
Red Rock Lakes	42	2 2 3 3			
Scapegoat Wilderness Area	27	1 1 2 2			
Teton Wilderness Area	57	4 4 8 8			
Theodore Roosevelt National Park	178	5	9	24	24
UL Bend Wilderness Area	77	8	10	18	18
Washakie Wilderness Area	83	5 5 8 8			
Wind Cave National Park	262	18	19	28	31
Yellowstone National Park	84	2 2 5 5			

Location	Base Year (2004)	Coal Development Scenario			
		2015 Lower	2015 Upper	2020 Lower	2020 Upper
	No. of Days >10% Change in Visibility	Change in No. of Days >10% in visibility			
Sensitive Class II Areas[b]					
Absaroka Beartooth Wilderness Area	101	2	3	10	10
Agate Fossil Beds National Monument	251	20	20	26	26
Big Horn Canyon National Rec. Area	331	1	3	1	1
Black Elk Wilderness Area	236	34	36	47	47
Cloud Peak Wilderness Area	126	18	18	29	30
Crow Indian Reservation	360	4 4 3 3			
Devils Tower National Monument	274	25	25	31	32
Fort Belknap Indian Reservation	66	6	7	14	15
Fort Laramie National Historic Site	260	10	10	15	16
Jedediah Smith Wilderness Area	79	1 1 3 5			
Jewel Cave National Monument	261	19 21	36	37	
Lee Metcalf Wilderness Area	97	2 2 2 2			
Mount Naomi Wilderness Area	51	1	1	1	1
Mount Rushmore National Monument	222	36 36	49	52	
Popo Agie Wilderness Area	139	4	4	6	6
Soldier Creek Wilderness Area	268	18	18	19	19
Wellsville Mountain Wilderness Area	130	10	10	17	17
Wind River Indian Reservation	217	2	5	9	10

[a] Pristine attainment area.
[b] Certain federal assets with Class II status for which air quality and/or visibility are valued resources.
Source: 2009 update to the Task 3A Report (BLM 2009c).

Projected cumulative surface water impacts primarily include the impacts of CBNG production water discharge to ephemeral drainages and the surface disturbance and subsequent reclamation of drainages that result from coal mine expansion. Future coal mining in the PRB could remove intermittent or ephemeral streams and stockponds in various watershed. Coal mine permits provide for removal of first- through fourth-order drainages. During reclamation, third- and fourth-order drainages must be restored; first- and second-order drainages often are not replaced (Martin et al. 1988). Coal-mining-related surface water would be discharged into intermittent and ephemeral streams. Based on current trends, it is assumed that most, if not all, of the coal-mine-produced water would be consumed during operation. As discussed in section 3.5.2.2, changes in surface runoff would occur as a result of the destruction and reconstruction of drainage channels as mining progresses. Sediment control structures would be used to manage discharges of surface water from the mine permit areas. State and federal regulations require treatment of surface runoff from mined lands to meet effluent standards. Monitoring data from the mines indicate that water from the backfill will generally be acceptable for premining uses (primarily livestock watering). Modeling and monitoring indicate that the groundwater drawdown impacts of coal mining and CBNG development are overlapping.

The updated PRB Coal Review studies discuss potential cumulative impacts on wildlife from projected development activities in that study area. The area of habitat disturbance and reclamation for 2003 and 2007and the projected cumulative areas of disturbance and reclamation for 2010, 2015, and 2020 are shown in tables 4-2 and 4-3. As discussed above, impacts on wildlife and fisheries can be classified as no impact (threatened and endangered species), short-term, and long-term. Potential short-term impacts arise from habitat disturbance associated with a project's development and operation (e.g., coal mines, CBNG wells) and would cease upon project completion and successful reclamation in a given area. Potential long-term impacts consist of long-term or permanent changes to habitats and the wildlife populations that depend on those habitats, irrespective of reclamation success, and habitat disturbance related to longer term projects (e.g., power plant facilities, rail lines). Habitat fragmentation can result from activities such as roads, well pads, mines, pipelines, and overhead electrical power lines, as well as increased noise, elevated human presence, dispersal of noxious and invasive weed species, and dust from unpaved road traffic. These effects result in overall changes in habitat quality, habitat loss, increased animal displacement, reductions in local wildlife populations, and changes in species composition. However, the severity of these effects on terrestrial wildlife would depend on factors such as sensitivity of the species, seasonal use, type and timing of project activities, and physical parameters (e.g., topography, cover, forage, and climate). Potential cumulative effects on fisheries from of development activities would be closely related to impacts on ground and surface water resources.

The PRB Coal Review used the REMI Policy Insight regional economic model to project cumulative employment and population levels and associated impacts in the PRB for the upper and lower coal production scenarios in 2010, 2015, and 2020. Table ES-4 presents the recent and projected population levels for the counties included in the PRB Coal Review socioeconomic analysis. The Hay Creek II LBA would have no impact on local or regional populations.

Table ES-4. Recent and Projected PRB Population

Year	Campbell County	Converse County	Crook County	Johnson County	Sheridan County	Weston County	Six County PRB Total
Census							
2000 3	3,698	12,104	5,895	7,108	26,606	6,642	92,053
2003[a]	36,381 1	2,326	5,971	7,530	27,116	6,665	95,989
2006[a] 38,9	34	12,866	6,255	8,014	27,673	6,762	100,504
2009[a] 43,9	67	13,578	6,653	8,531	29,163	7,009	108,901
Projected Lower Coal Production Scenario							
2010 45,9	25	13,103	6,542	8,389	28,459	7,108	109,526
2015 48,9	05	13,671	6,759	8,867	30,016	7,174	115,392
2020 50,9	95	14,193	6,989	9,326	31,467	7,208	120,178
Projected Upper Coal Production Scenario							
2010 47,6	62	13,160	6,570	8,424	28,579	7,137	111,532
2015 51,5	58	13,763	6,802	8,924	30,214	7,219	118,480
2020 54,9	43	14,313	7,045	9,403	31,733	7,266	124,703

[a] Projected by U.S. Census Bureau based on 2000 data.

Source: U.S. Census Bureau (2006a) and 2005 Task 3C Report (BLM 2005a).

1.0 INTRODUCTION

This environmental impact statement (EIS[1]) presents the analysis of impacts that would result from leasing federal coal reserves in the Hay Creek II lease by application (LBA) tract (Proposed Action). The EIS also analyzes alternatives to the Proposed Action.

This EIS was prepared in accordance with the National Environmental Policy Act (NEPA) and associated rules and guidelines. As administrator of the federal coal leasing program for surface and underground mining under the Mineral Leasing Act of 1920, as amended, the U.S. Bureau of Land Management (BLM) is considered the lead agency, under NEPA, responsible for the preparation of this EIS.

The BLM will use this impact analysis to make a decision regarding unleased federal coal reserves within and adjacent to the Buckskin Mine, an operating surface coal mine in the Powder River Basin (PRB) of northeast Wyoming. Issuing a federal coal lease does not authorize mining to occur, but is the first step in that process. The lease merely grants the lessee the exclusive right to pursue a mining permit for the coal tract subject to the terms of the lease, the mining permit itself, and all applicable state and federal laws. Permits to mine are issued by authorized federal and/or state agencies only after a lease has been secured and all appropriate agencies have reviewed and approved an extensive permit application. That application document provides information describing a wide range of baseline resources, as well as detailed mining, mitigation, and reclamation plans.

A minimum of 12 other state and federal agencies will also use this EIS analysis to make decisions related to leasing and mining the federal coal reserves in the proposed tract. The Office of Surface Mining Reclamation and Enforcement (OSM) and all divisions of the Wyoming Department of Environmental Quality (WDEQ) are cooperating agencies on this EIS. The OSM is primarily responsible for administering federal programs that regulate surface coal mining operations. If a tract is leased, that agency will use this EIS to determine whether approval of the mining plan for the tract complies with the Mineral Leasing Act of 1920. The WDEQ has entered into a cooperative agreement with the Secretary of the Interior to regulate surface coal mining operations on federal and nonfederal lands in Wyoming. During the permitting process, the WDEQ incorporates input from numerous internal departments as well as various state and federal agencies.

The WDEQ has also been delegated authority by the U.S. Environmental Protection Agency (EPA) to implement federal programs of the Clean Air Act (CAA) Amendments of 1990. The WDEQ implements the Wyoming Air Quality Standards and Regulations and CAA Amendments through various air permitting programs. Input from the Wyoming Game and Fish Department (WGFD) and the U.S. Fish and Wildlife Service (USFWS) is used to ensure that adequate monitoring, mitigation, and reclamation plans are in place for wildlife and fisheries

---

[1] Refer to page xx for a list of abbreviations and acronyms used in this document.

resources and habitats. The Wyoming Department of Transportation may review the EIS if road construction or relocation projects are considered in the analyses.

The public has several opportunities to comment throughout the coal leasing and permitting processes. For leasing decisions, the public may participate during the initial scoping of the project, as well as through public hearings and comment periods that are held for the draft and final EIS. Once the coal is leased by the BLM, the public has several additional opportunities to comment on the actual permit to mine issued by the WDEQ and OSM, including the original permitting process, every major change to the permit after its initial approval, and every five years during the standard permit renewal process for surface coal mines in Wyoming.

1.1 Background

The Buckskin Mine is one of several mines currently operating in the PRB, where the coal seams are notably thick and the overburden is relatively thin throughout the region. The mine is operated by the Buckskin Mining Company, a directly held subsidiary of Kiewit Mining Properties, Inc. (Kiewit).

1.1.1 Buckskin Mine Application

On March 24, 2006, Kiewit filed an application to lease the federal coal reserves included in the Hay Creek II maintenance LBA tract under the regulations at 43 Code of Federal Regulations (CFR) 3425 (Leasing on Application). A maintenance coal tract is an area of federal coal reserves that is adjacent to an existing coal lease and can be excavated by an active coal mine. The maintenance tract is located approximately 12 miles north of Gillette, Campbell County, Wyoming (map 1-1), northwest of and immediately adjacent to existing federal coal leases for the Buckskin Mine. The tract would maintain current average levels of production rather than expand mine operations.

Kiewit initially applied for the Hay Creek II maintenance tract to extend the life of existing operations at the Buckskin Mine. Since submitting its original application in 2006 (see "applicant original (March 2006) tract" on map 1-2), Kiewit modified its lease application due to changing needs (see "applicant proposed tract" on map 1-2). The applicant proposed tract (proposed tract) from November 28, 2008, was analyzed in the draft EIS. That proposed tract was the bare minimum needed to provide a technically and economically feasible method for the Buckskin Mine to pass through a geologic irregularity known as the Sand Channel Basin to reach low-sulfur compliance coal in the existing Spring Draw lease (WYW-78634).

Unforeseen LBA processing delays caused Buckskin to lose the mechanical advantage needed to mine past the sand channel. Consequently, on September 3, 2010, Kiewit requested that the BLM consider a tract configuration under Alternative 2 (see chapter 2) based on the original tract configuration applied for in March 2006. Buckskin no longer needs the coal immediately and, therefore, prefers to pursue a tract with a longer-term application for its existing mining operations.

For the purposes of this analysis, the proposed tract remains unchanged from the draft EIS. Because both the BLM study area and the general analysis area, as defined in chapter 3, encompassed all configurations of Kiewit's proposed tract, the analyses performed for the draft EIS are still valid for the final EIS. Therefore, because the tract as originally applied for has been fully covered, it will not be analyzed separately in this document.

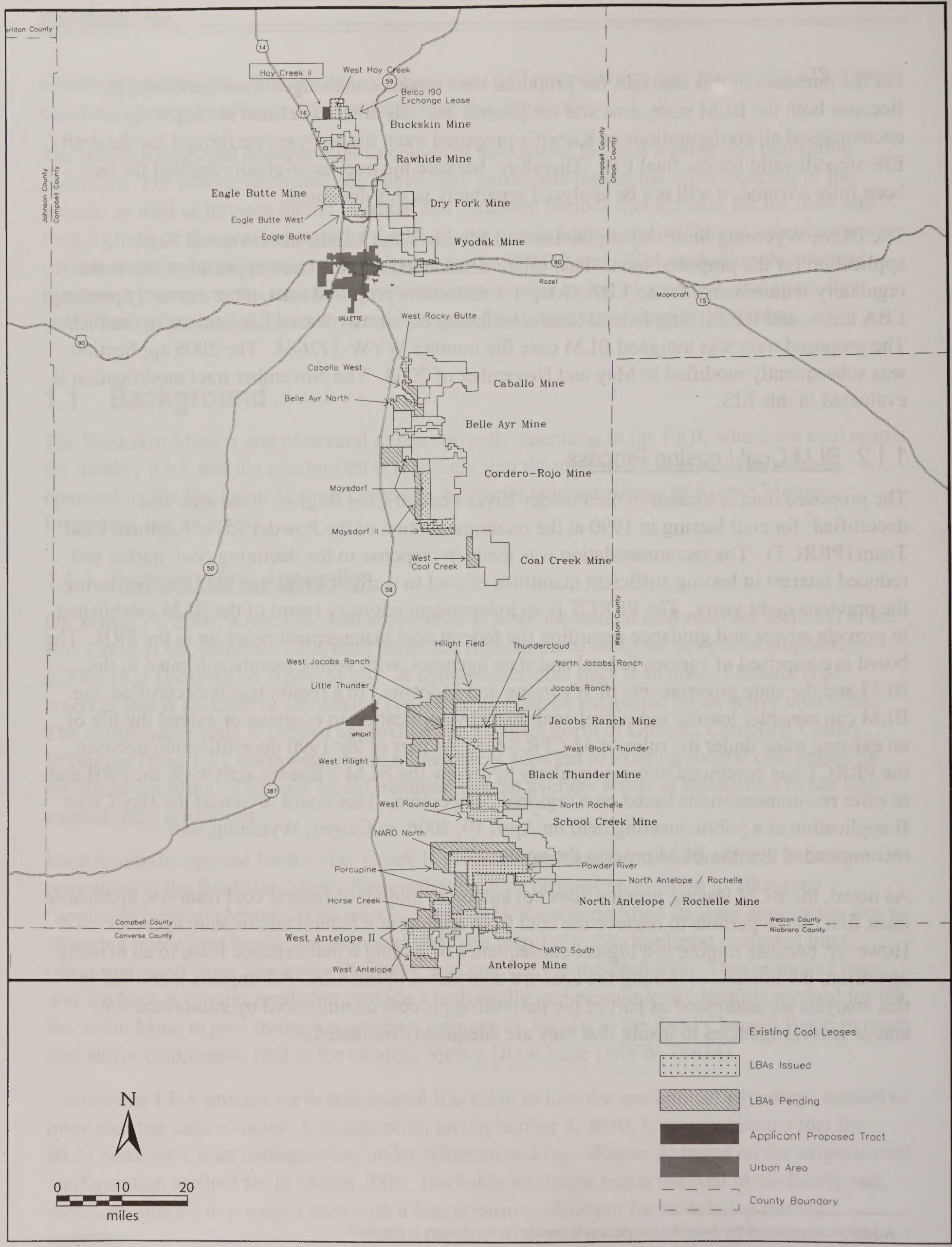
The BLM, Wyoming State Office, Division of Minerals and Lands, has reviewed Kiewit's application for the proposed tract. That office determined that the lease application meets the regulatory requirements for an LBA. Map 1-1 shows the proposed tract, other currently pending LBA tracts, and the existing federal leases, including previously leased LBA tracts, in the PRB. The proposed tract was assigned BLM case file number WYW-172684. The 2006 application was subsequently modified in May and November of 2008. The November tract modification is evaluated in this EIS.

1.1.2 BLM Coal Leasing Process

The proposed tract is located in the Powder River Federal Coal Region. That area was decertified[2] for coal leasing in 1990 at the recommendation of the Powder River Regional Coal Team (PRRCT). The recommendation was made in response to the declining coal market and reduced interest in leasing sufficient quantities of coal to warrant a regional sale process during the previous eight years. The PRRCT is an independent advisory board of the BLM established to provide advice and guidance regarding the federal coal management program in the PRB. The board is comprised of various federal and state agencies, with voting members limited to the BLM and the state governments of Wyoming and Montana. In a region that is decertified, the BLM can consider leasing individual coal tracts by application to continue or extend the life of an existing mine under the rules of 43 CFR 3425. As part of the 1990 decertification decision, the PRRCT has continued to meet regularly to review the BLM's leasing activity in the PRB and to offer recommendations based on a regional perspective. That board reviewed the Hay Creek II application at a public meeting held on April 19, 2006, in Casper, Wyoming, and recommended that the BLM process the application.

As noted, the BLM leasing process does not authorize mining of federal coal reserves; applicants must first obtain permits to retrieve the coal from appropriate federal and/or state agencies. However, because mining is a logical consequence of issuing a maintenance lease to an existing operation, the impacts of mining the coal are considered in this EIS. All impacts identified in this analysis are addressed as part of the permitting process administered by authorized state and/or federal agencies to insure that they are adequately mitigated.

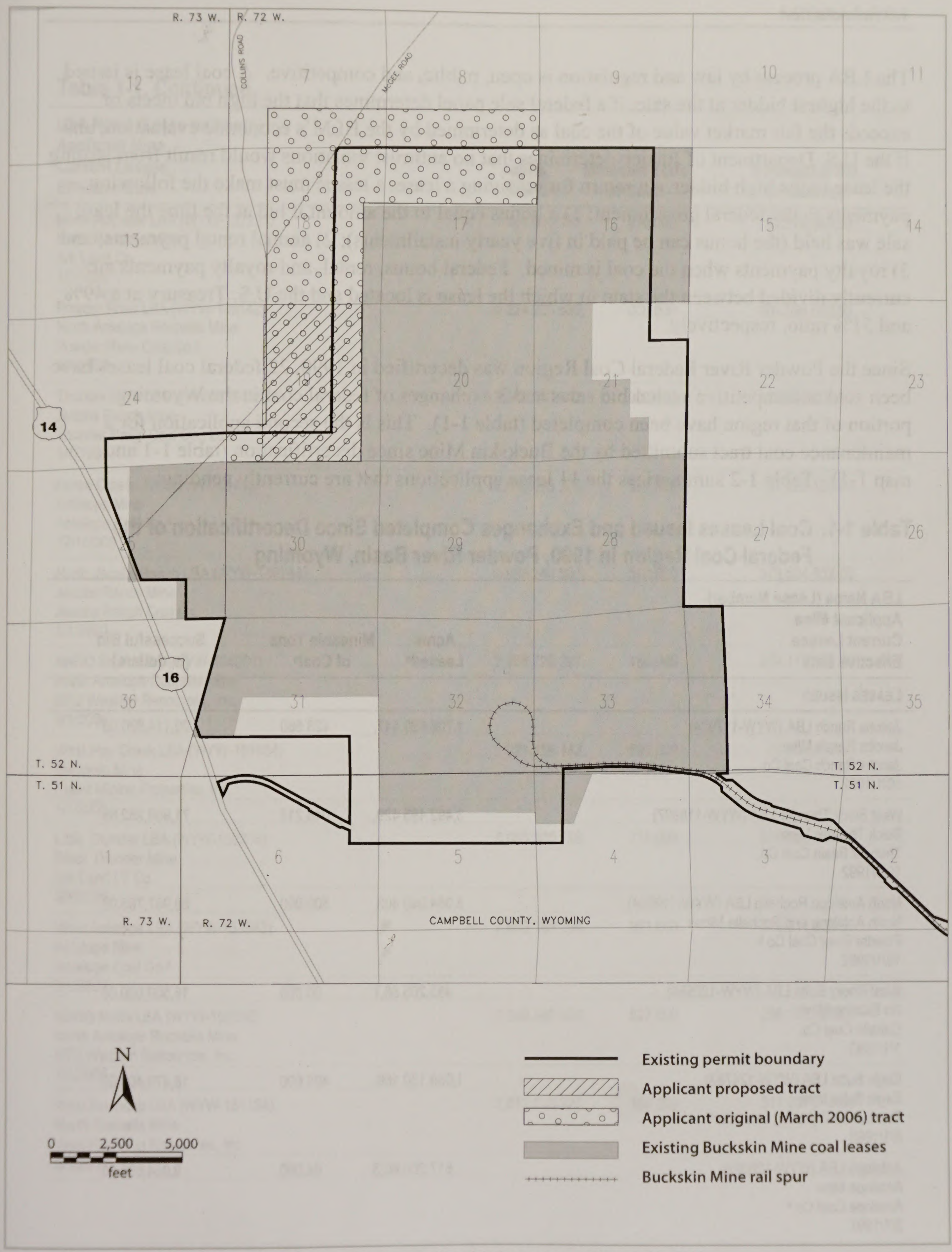
[2] A detailed description of the decertification process is provided in the glossary in chapter 7.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 1-1

General Location Map with Federal Coal Leases and LBA Tracts



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 1-2

Applicant Proposed and Original (March 2006) Tracts

The LBA process by law and regulation is open, public, and competitive. A coal lease is issued to the highest bidder at the sale, if a federal sale panel determines that the high bid meets or exceeds the fair market value of the coal as determined by the BLM's economic evaluation, and if the U.S. Department of Justice determines that no antitrust violations would result from issuing the lease to the high bidder. In return for receiving a lease, a lessee must make the following payments to the federal government: 1) a bonus equal to the amount it bid at the time the lease sale was held (the bonus can be paid in five yearly installments); 2) annual rental payments; and 3) royalty payments when the coal is mined. Federal bonus, rental, and royalty payments are currently divided between the state in which the lease is located and the U.S. Treasury at a 49% and 51% ratio, respectively.

Since the Powder River Federal Coal Region was decertified in 1990, 22 federal coal leases have been sold at competitive sealed-bid sales and 3 exchanges of federal coal in the Wyoming portion of that region have been completed (table 1-1). This is the second application for a maintenance coal tract submitted by the Buckskin Mine since decertification (table 1-1 and map 1-1). Table 1-2 summarizes the 11 lease applications that are currently pending.

Table 1-1. Coal Leases Issued and Exchanges Completed Since Decertification of the Federal Coal Region in 1990, Powder River Basin, Wyoming

LBA Name (Lease Number) Applicant Mine Current Lessee Effective Date	Acres Leased[a]	Mineable Tons of Coal[a]	Successful Bid (in dollars)
LEASES ISSUED			
Jacobs Ranch LBA (WYW-117924) Jacobs Ranch Mine Jacobs Ranch Coal Co. 10/1/1992	1,708.620 147,	423,560	20,114,930.00
West Black Thunder LBA (WYW-118907) Black Thunder Mine Thunder Basin Coal Co. 10/1/1992	3,492.495 429,	048,216	71,909,282.69
North Antelope Rochelle LBA (WYW-119554) North Antelope and Rochelle Mines Powder River Coal Co.[b] 10/1/1992	3,064.040 403,	500,000	86,987,765.00
West Rocky Butte LBA (WYW-122586) No Existing Mine[c] Caballo Coal Co. 1/1/1993	463.205 56,7	00,000	16,500,000.00
Eagle Butte LBA (WYW-124783) Eagle Butte Mine Foundation Wyoming Land Co.[d] 8/1/1995	1,059.180 166,	400,000	18,470,400.00
Antelope LBA (WYW-128322) Antelope Mine Antelope Coal Co.[e] 2/1/1997	617.200 60,3	64,000	9,054,600.00

Table 1-1. Continued

LBA Name (Lease Number) Applicant Mine Current Lessee Effective Date	Acres Leased[a]	Mineable Tons of Coal[a]	Successful Bid (in dollars)
North Rochelle LBA (WYW-127221) North Rochelle Mine Ark Land Co. 1/1/1998	1,481.930	157,610,000	30,576,340.00
Powder River LBA (WYW-136142) North Antelope Rochelle Mine Powder River Coal Co.[b] 9/1/1998	4,224.225	532,000,000	109,596,500.00
Thundercloud LBA (WYW-136458) Jacobs Ranch Mine Thunder Basin Coal Co., LLC 1/1/1999	3,545.503	412,000,000	158,000,008.50
Horse Creek LBA (WYW-141435) Antelope Mine Antelope Coal Co.[e] 12/1/2000	2,818.695	275,577,000	91,220,120.70
North Jacobs Ranch LBA (WYW-146744) Jacobs Ranch Mine Jacobs Ranch Coal Co. 5/1/2002	4,982.240	537,542,000	379,504,652.00
NARO South LBA (WYW-154001) North Antelope Rochelle Mine BTU Western Resources, Inc. 9/1/2004	2,956.725	297,469,000	274,117,684.00
West Hay Creek LBA (WYW-151634) Buckskin Mine Kiewit Mining Properties, Inc. 1/1/2005	921.158	142,698,000	42,809,400.00
Little Thunder LBA (WYW-150318) Black Thunder Mine Ark Land LT Co. 3/1/2005	5,083.500	718,719,000	610,999,949.80
West Antelope LBA (WYW-151643) Antelope Mine Antelope Coal Co.[e] 3/1/2005	2,809.130	194,961,000	146,311,000.00
NARO North LBA (WYW-150210) North Antelope Rochelle Mine BTU Western Resources, Inc. 3/1/2005	2,369.380	324,627,000	299,143,785.00
West Roundup LBA (WYW-151134) North Rochelle Mine West Roundup Resources, Inc. 5/1/2005	2,812.510	327,186,000	317,697,610.00

Table 1-1. Continued

LBA Name (Lease Number) Applicant Mine Current Lessee Effective Date	Acres Leased[a]	Mineable Tons of Coal[a]	Successful Bid (in dollars)
Eagle Butte West LBA (WYW-155132) Eagle Butte Mine Foundation Wyoming Land Co.[d] 2/20/2008[f]	1,427.770	255,000,000	180,540,000.00
South Maysdorf (Mt. Logan) (WYW-174407)[g] Cordero Rojo Cordero Mining Co. 4/22/2008	2,900.240	288,081,000	250,800,000.00
North Maysdorf (Mt. Logan) (WYW-154432)[g] Cordero Rojo Cordero Mining Co. 1/29/2009	445.890	54,657,000	48,098,424.00
West Antelope II North (WYW-163340)[h] Antelope Mine Antelope Coal, LLC Coal Lease Sale 5/11/2011	2,837.630	350,263,000	297,723,228.00
West Antelope II South (WYW-177903)[h] Antelope Mine Antelope Coal, LLC Coal Lease Sale 6/15/2011	1,908.600	56,356,000	49,311,500.00
Total Leases Issued	**53,929.870**	**6,188,181,776**	**3,509,478,179.69**
EXCHANGES COMPLETED			
EOG (Belco) I-90 Lease Exchange (WYW-150152) EOG Resources (formerly Belco)[i] I-90 Lease Exchanged for New Lease 4/1/2000	599.170	106,000,000	Lease rights to Belco I-90 Lease (WYW0322794)
Pittsburgh & Midway Coal Exchange (WYW-148816) Pittsburgh & Midway Coal Mining Co. Private Land Exchanged for Federal Coal 1/27/2005	2,045.530	84,200,000	6,065.77 acres of land and some minerals in Lincoln, Carbon, and Sheridan Counties, Wyoming
Powder River Coal Company Gold Mine Draw (WYW-003397 and WYW-83394)Powder River Coal Co.[b] AVF Coal Lease 6/30/2006	623.000	47,700,000	Lease rights to 921.6 acres of leased federal coal underlying an AVF exchanged for adjacent bypass coal
Total Exchanges Completed	**3,267.70**	**237,900,000**	

Table 1-1. Continued

LBA = lease by application AVF = alluvial valley floor

[a] Information from sale notice.

[b] Name changed to Powder River Coal, LLC in August 2006 and Peabody Powder River Mining, LLC in 2011.

[c] The West Rocky Butte LBA was originally leased to Northwestern Resources Company. The lease has been assigned and incorporated into the Caballo Mine.

[d] Ownership of the Eagle Butte Mine and Belle Ayr Mine changed from Foundation Coal West, Inc., to Alpha Coal West, Inc. as of July 31, 2009. Notification of new ownership was submitted to the BLM in August 2009.

[e] Notification of a name change to Antelope Coal, LLC was submitted to the WDEQ in August 2008.

[f] Sale date.

[g] The applied-for LBA (original and modified) was classified under one serial number (WYW-154432) until a later determination was made to split it into North and South.

[h] The applied-for LBA (original and modified) was classified under one serial number (WYW-163340) until a later determination was made to split it into North and South.

[i] The EOG Resources Belco Exchange lease is now owned by the Buckskin Mine.

Source: BLM Lease by Application Data Sheets (BLM 2009a).

Table 1-2. Pending Coal Leases by Application, Powder River Basin, Wyoming

LBA Name (Lease Number) Applicant Mine	Application Date	Acres as Applied for	Estimated Coal[a] as Applied for (million tons)	Status
Belle Ayr North (WYW-161248) Belle Ayr Mine	7/6/2004 1,57	8.74	191.90	Final EIS available 8/20/2009 Record of Decision available 7/30/2010
North Hilight Field (WYW-164812) Black Thunder Mine	10/7/2005 2,61	3.50	263.40	Final EIS available 7/30/2010 Record of Decision in preparation
South Hilight Field (WYW-174596) Black Thunder Mine	10/7/2005	1,976.69	213.60	Final EIS available 7/30/2010 Record of Decision available 3/4/2011
West Hilight Field (WYW-172388) Black Thunder Mine	1/17/2006	2,370.52	377.90	Final EIS available 7/30/2010 Record of Decision in preparation
West Coal Creek (WYW- 172585) Coal Creek Mine	2/10/2006	1,151.26	57.00	Final EIS available 8/20/2009 Record of Decision available 6/10/2011
Caballo West (WYW-172657) Caballo Mine	3/15/2006	777.49	81.80	Final EIS available 8/20/2009 Record of Decision available 8/6/2010
West Jacobs Ranch (WYW-172685) Jacobs Ranch Mine	3/24/2006	5,944.37	669.60	Final EIS available 7/30/2010 Record of Decision in preparation

Table 1-2. Continued

LBA Name (Lease Number) Applicant Mine	Application Date	Acres as Applied for	Estimated Coal[a] as Applied for (million tons)	Status
Hay Creek II (WYW-172684) Buckskin Mine	3/24/2006; Modified 5/19/2008, 11/28/2008, and 9/3/2010	419.04	77.2	Draft EIS available 3/12/2010 Public hearing 4/22/2010 Final EIS available 7/29/2011
Maysdorf II (WYW-173360) Cordero Rojo Mine	9/1/2006	4,653.84	474.50	Final EIS available 8/20/2009 Record of Decision in preparation
North Porcupine (WYW-173408) North Antelope Rochelle Mine	9/27/2006; Modified 10/12/2007	5,795.78	601.20	Final EIS available 7/30/2010 Record of Decision in preparation
South Porcupine (WYW-176095) North Antelope Rochelle Mine	9/29/2006; Modified 10/12/2007	3,185.96	309.70	Final EIS available 7/30/2010 Record of Decision in preparation
Total LBAs Pending		**30,467.19**	**3,317.80**	

LBA = lease by application; EIS = environmental impact statement

[a] Estimated tons of in-place or mineable coal, as reported in the lease application, or of recoverable coal as reported by the applicant, depending on the mine.

Source: BLM Lease by Application Data Sheets (BLM 2009a).

1.1.3 Existing Buckskin Mine

1.1.3.1 *General Description*

The WDEQ approved the current Buckskin Mine permit (Permit 500 Term T7) on May 22, 2006. The existing Buckskin Mine permit area is approximately 8,011.5 acres and encompasses previously permitted federal and state coal leases (5,877.9 and 659.5 acres, respectively). Map 1-3 shows the proposed tract in relation to the existing mine permit area and leases.

Approximately 6,727.8 acres is expected to be disturbed by activities related to extracting existing coal reserves. The total anticipated disturbance area exceeds the leased area because of the need for mine support activities, described below in section 1.1.3.3. The permit area is larger than the leased or disturbed area to ensure that all disturbed lands are within the permit boundary and to allow for an easily defined legal land description.

As of December 2008, Kiewit estimates the in-place coal reserves in the existing Buckskin Mine leases to be 460.9 million tons, of which 344.3 million tons are recoverable. Through December 2008, the mine had produced a total of 339.8 million tons of coal. Annual production averaged 20.6 million tons over the previous seven years, with a maximum of 25.3 million tons in any single year (Buckskin Mining Company 2002, 2003, 2004, 2005, 2006, 2007, 2008, and 2009). The Buckskin Mine's current air quality permit, as approved by the WDEQ, allows mining of as much as 42 million tons of coal per year. Kiewit estimates that the average annual production at

the mine after January 1, 2009, will be 25 million tons per year. If production continues at that rate, Kiewit estimates that the post-2008 recoverable reserves at the Buckskin Mine would be depleted within approximately 14 years.

Surface ownership within the existing permit area is private. Existing land uses in the proposed tract include rangeland livestock grazing, wildlife habitat, pastureland, dryland cropland, and coal bed natural gas (CBNG) development. All oil and gas production facilities located in the proposed tract are also privately owned. Surface ownership is discussed further in section 1.5 and section 3.11; ownership of oil and gas estates is discussed in section 3.11.

1.1.3.2 *Mine Facilities and Employees*

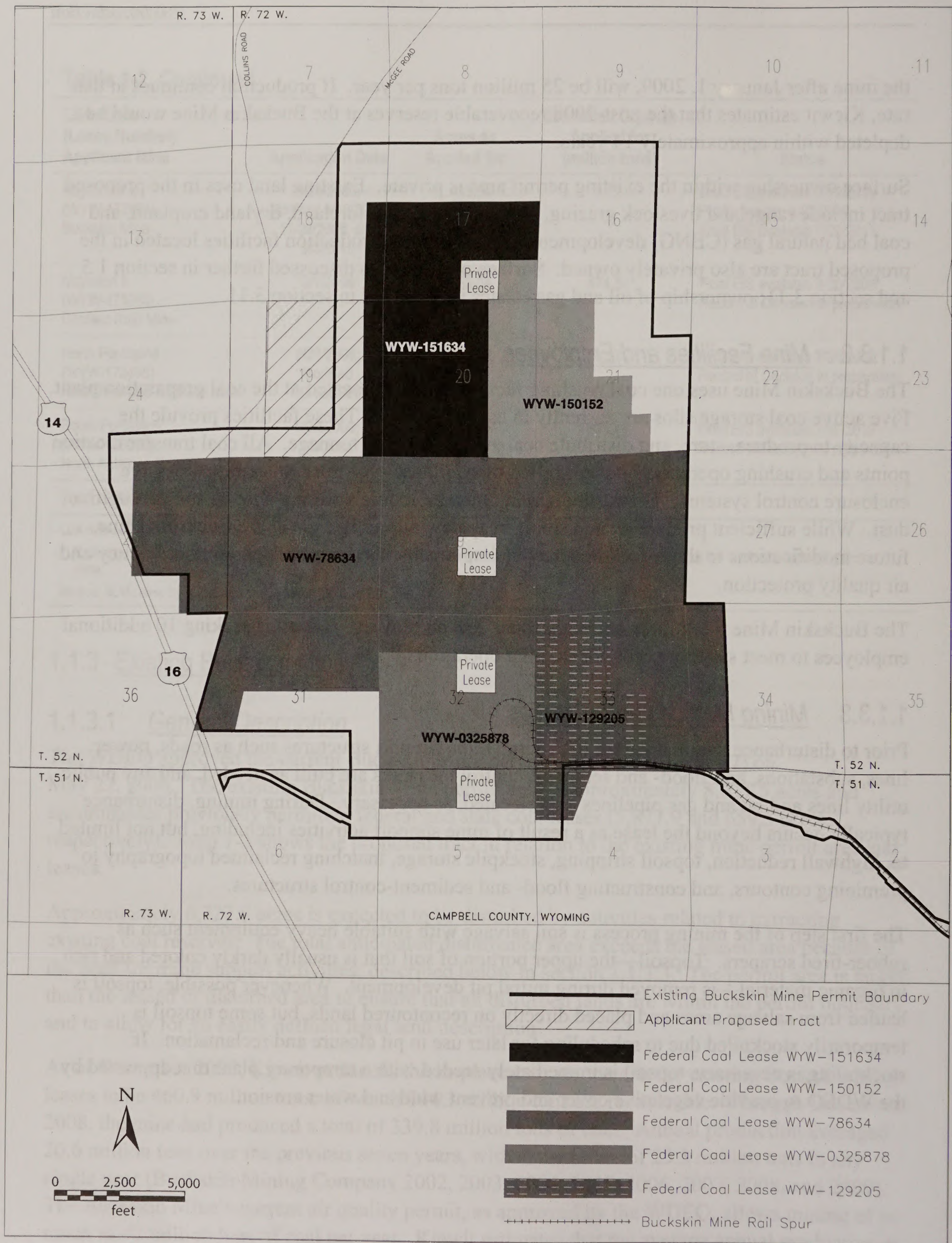
The Buckskin Mine uses one coal crushing facility, which is located at the coal preparation plant. Five active coal storage silos are currently in use at the mine. These facilities provide the capacity to produce, store, and distribute coal at the permitted tonnage. All coal transfer location points and crushing operations are controlled by baghouse-type dust collectors or passive enclosure control systems. The truck dumping operation uses a stilling shed to control fugitive dust. While sufficient production and storage capacity currently exist at the Buckskin Mine, future modifications to those facilities may be implemented to improve operating efficiency and air quality protection.

The Buckskin Mine work force currently totals 338 employees. Kiewit is seeking 10 additional employees to meet staffing needs for existing operations.

1.1.3.3 *Mining Methods and Activities*

Prior to disturbance and in advance of mining, mine support structures such as roads, power lines, substations, and flood- and sediment-control measures are built as needed, and any public utility lines and oil and gas pipelines are relocated, as necessary. During mining, disturbance typically occurs beyond the lease as a result of mine support activities including, but not limited to, highwall reduction, topsoil stripping, stockpile storage, matching reclaimed topography to premining contours, and constructing flood- and sediment-control structures.

The first step of the mining process is soil salvage with suitable heavy equipment such as rubber-tired scrapers. Topsoil—the upper portion of soil that is usually darkly colored and rich in organic material—is removed during initial pit development. Whenever possible, topsoil is hauled from salvage areas and placed directly on recontoured lands, but some topsoil is temporarily stockpiled due to scheduling for later use in pit closure and reclamation. If stockpiling is necessary, topsoil is immediately seeded with a temporary plant mix approved by the WDEQ to provide vegetative cover and prevent wind and water erosion.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 1-3

Buckskin Mine's Existing Federal Coal Leases and Applicant Proposed Tract

After soil salvage operations are complete, overburden removal is conducted primarily with truck/shovel fleets. Other equipment used during this phase includes dozers, scrapers, excavators, front-end loaders, graders, and water trucks. When necessary, blasting is used to loosen the overburden; however, the Buckskin Mine does not use cast blasting to move overburden. Blast holes are drilled down through the overburden—the rock and soil above the coal seam, excluding topsoil—to the top of the upper-most mineable coal seam. The drill holes are then loaded with explosives—a mixture of ammonium nitrate and fuel oil—and detonated to fragment the overburden to facilitate efficient excavation. Overburden is placed directly into already mined pits or stockpiled for later use as backfill. The perimeter of the open pit consists of sheer highwalls with vertical heights equal to the combined depth of the overburden, the coal seam, and interburden—the layer of sedimentary rock that separates two mineable coal beds—if present. If necessary, streams are diverted into temporary channels around active mining areas or contained in temporary reservoirs to prevent pits from being flooded.

Coal is currently produced at the Buckskin Mine from two coal seams, the Anderson (averaging 45 feet thick) and the Canyon (averaging 70 feet thick). The blasting and shovel/truck fleet methods used to remove overburden are also used to recover the coal. Coal is mined at several working pit faces at the same time to enable blending of the coal to meet customer quality requirements, to comply with the BLM lease requirements for maximum economic recovery of the coal resource, and to optimize coal removal efficiency with available equipment. Exposed coal seams are cleaned with a dozer, drilled, and blasted to facilitate efficient excavation. Coal is loaded with electric-powered shovels or hydraulic excavators into off-highway haul trucks for transport to the coal preparation plant. Coal haul roads are temporary structures constructed in the mine areas. Haul roads are watered and sprayed with dust suppressant to protect air quality.

Coal from the Buckskin Mine is sold to a variety of domestic power utilities in an open market and is shipped by commercial rail to the purchasing utilities; none of the coal from the mine is used in power plants currently located in the PRB or sold to international markets.

1.1.3.4 *Reclamation Activities*

Reclamation activities follow mining activities according to the WDEQ-approved reclamation plan. A direct permanent impact of coal mining is topographic moderation. Mined-out areas must be reclaimed to the original contours or other topographic configurations approved by the WDEQ to the extent possible. All topographic features such as upland draws, channel bottoms, and elevations are reconstructed to closely mimic premining conditions and ensure proper drainage of water across the reclaimed backfill. While the postmining topography is similar to the premining topography, it is typically gentler and more uniform in appearance. The removal of the coal is temporarily and partially offset by the swelling that occurs when overburden and interburden are blasted, excavated, and backfilled; the influence of swelling is diminished or lost once the backfill has settled. Any disturbed drainages are reclaimed to follow premining patterns. In-channel stockponds and playas (shallow topographic depressions) are replaced to provide livestock and wildlife watering sources. As indicated, all postmining topography, including reconstructed drainages, must be approved by the WDEQ. After mining, the land is

reclaimed to support the premining uses described in section 1.1.3.1. Oil and gas wells, pipelines, and utility easements are reestablished as required.

Most overburden is placed directly into areas where coal has already been removed. Replaced overburden is graded to reflect an approved postmine surface contour, as required by WDEQ and OSM rules. Elevations consistent with an approved postmining topography plan are established as quickly as possible. Once the overburden has been replaced and recontoured, it is sampled and analyzed to verify its suitability as subsoil. Material found to be unsuitable for use in reestablishing vegetation or that could affect groundwater quality due to high concentrations of certain parameters, such as selenium or adverse pH levels, is either removed and treated or adequately covered with suitable overburden material prior to depositing topsoil. Under certain conditions, the postmining topography is not immediately achievable. This occurs when an excess material requires temporary stockpiling, when insufficient material is available from current overburden removal operations, or when future mining could redisturb an area already mined.

Once the postmining topography has been completed, the regraded backfill is ripped to relieve soil compaction. Topsoil is then redistributed using rubber-tired scrapers or haul trucks, dozers, and blades and a seedbed is established by ripping or plowing the soil. Once topsoil preparation is completed, it is immediately seeded using native grasses, forbs, and shrubs that are consistent with the postmining land use. Permanent reclamation must be seeded with WDEQ-approved seed mixes. Reseeded areas are monitored for a minimum of 10 years to evaluate the success of vegetation growth and the establishment of a variety of plant species prior to the final (Phase III) release of the reclamation bond. Other parameters, such as successful use of reclaimed areas by livestock and wildlife, also must be demonstrated before Phase III bond release is achieved. All reclamation goes through rigorous monitoring and a process of success verifications dictated by the WDEQ before any bonds are released on reclaimed lands.

Chapter 4, Section 2(b)(i) of the WDEQ Coal Rules and Regulations requires that rough backfilling and grading follow coal removal as closely as possible based on the mining conditions. According to a recent OSM evaluation of the Wyoming coal mining industry, the 2007 reclamation-to-disturbance ratio was approximately 80% (12,258 total acres reclaimed versus 15,321 total acres disturbed) (OSM 2008). The remaining 20% of disturbance consists of long-term facilities and infrastructure such as coal storage silos and processing plants, roads, and rail lines. Those lands will be reclaimed when mine operations cease and all infrastructure has been removed from the site. The WDEQ also requires that mining companies post a reclamation bond on all acres disturbed by their activities within their own permit boundary. The bond must be large enough to cover the cost of completing reclamation, should the company default on its obligations. One major condition for receiving Phase III bond release is to document that the reclaimed area has achieved the vegetative cover and production, and plant species diversity equal to a predetermined native comparison area, the reference area. For example, if shrubs were present during baseline vegetative inventories, the reclaimed area must also have a shrub density of one plant per square meter over 20% of the area. The Buckskin Mine has a vigorous annual

program of vegetation monitoring to ensure that reclamation efforts are proceeding in a positive manner to achieve final bond release.

Land Status categories are calculated on an annual basis and reported in the Annual Report to the WDEQ. The parameters of each phase of bond release are described in detail in WDEQ Guideline 20, available on the agency's website at http://deq.state.wy.us/lqd/guidelines.

Table 1-3 provides a general summary of reclaimed acreages at the Buckskin Mine and their respective stages of bond release. As of December 31, 2008, Buckskin had disturbed approximately 3,815 acres over the life of the mine, of which about 1,035 (27.3%) are associated with long-term mining facilities that will not be reclaimed until all mining operations have ceased. Approximately 1,256 (33%) of the 3,815 disturbed acres had been permanently reclaimed through that year. Approximately 4,018 acres and 1,271 acres were disturbed and reclaimed, respectively, through 2009. Because the analyses for the draft EIS were performed using data collected through 2008, data from 2009 is not included in further discussions in this document with the exception of certain specific resources in response to public comments on the draft EIS.

Permanently reclaimed areas refer to all affected lands that have been backfilled, graded, re-topsoiled, and permanently seeded according to approved practices specified in the WDEQ approved Reclamation Plan for the mine. Permanently reclaimed lands must then meet various benchmarks associated with vegetative conditions as well as wildlife and livestock grazing before they achieve Phase III bond release.

Reclaimed lands often fall into multiple bond release categories at the same time due to two primary factors: the overlap between activities in a given reclamation area; and the time-lag between reclamation actions, such as reseeding with permanent seed mixes, and responses to those actions (e.g., vegetation growth and production) necessary to receive Phase III bond release. Consequently, the reclaimed acreages shown in table 1-3 for three phases of bond release do not add up to the total 1,256 acres of reclaimed land through 2008.

To achieve Phase III Bond Release, reclaimed lands must also support the postmining land use (i.e., domestic livestock grazing and wildlife use), as determined through grazing trials and by monitoring wildlife use during the reclamation period. At the Buckskin Mine, reclamation is typically grazed by fencing multiple fields together to create a larger pasture; multiple pastures are sometimes also combined. The mine first began grazing cattle in 1998 and continued grazing efforts in 9 of the 10 subsequent years (1999 through 2008). The number of cattle grazed during a given period ranged from 107 to 200 during that period, with an average grazing time of 34 days (range 12 to 63 days) in a given pasture. Grazing cattle consisted primarily of cow-calf pairs, with a few bulls included in some years. Annual wildlife monitoring efforts at the Buckskin Mine are described in section 3.10, and have included reclaimed lands as they became established. The WGFD reviews the annual wildlife report each year to ensure that proper survey protocols have been followed and to monitor impacts to wildlife populations in the

vicinity of the surface coal mines in the PRB. That agency has not identified any deficiencies in the Buckskin Mine annual wildlife reports.

Table 1-3. Summary of Land Status Acreage at the Buckskin Mine through December 2008

Land Status	Acres	Approximate Percentages
Undisturbed areas	4,196	52% of 8,011 total acres in permit area
Disturbed areas	3,815	48% of 8,011 total acres in permit area
Long-term facilities[a]	1,035	27% of disturbance
Active mining and reclamation	1,525	40% of disturbance
Reclaimed land[b]	1,256	33% of disturbance
Phase I[c] bond release	1,212	96% of reclamation
Phase II[d] bond release	250	20% of reclamation
Phase III[e] final bond release	250	20% of reclamation

[a] Long-term facilities includes stockpiles, hydrologic control structures, mine buildings, coal-loading facilities, the main access road, electrical substations, vehicle parking areas, the railroad loop, environmental monitoring areas, and other similar structures and features that will not be reclaimed until all mining operations have ceased.

[b] Reclaimed land refers to previously disturbed areas that have been planted with permanent seed mixes.

[c] Phase I refers to areas where backfilling, re-grading, topsoil replacement, contouring, and drainage control have been completed in a bonded area in accordance with the mine's approved reclamation plan.

[d] Phase II refers to areas that have achieved Phase I release, and also have vegetation species composition commensurate with that of the seed mix(es) and species composition required by the WDEQ-approved Reclamation Plan. Mines often go directly from Phase I to Phase III due to the overlap between Phase II and Phase III.

[e] Phase III refers to lands that have been reclaimed to the approved postmine land use and with successful restoration of wildlife habitat; where revegetation performance standards, shrub establishment goals, and tree replacement requirements have been met; the postmining groundwater, and surface water quality and quantity support land uses; any approved postmining road types and corridors on evaluated acreage are in place and functional; and any temporary structures present on lands being evaluated have been removed.

1.1.3.5 *Hazardous and Solid Waste*

Wastes produced by current mining activities at Buckskin are handled according to the procedures described in WDEQ Mine Permit 500 Term T7, approved May 22, 2006. Solid waste produced at the existing Buckskin Mine consists of floor sweepings, shop rags, lubricant containers, welding rod ends, metal shavings, worn tires, packing material, used filters, and office and food wastes. A small portion (< 5%) of the solid wastes produced at the mine is disposed of within the Buckskin Mine permit boundary in accordance with WDEQ approved solid waste disposal plans. Solid waste is also disposed of at the Campbell County landfill. Sewage is handled by WDEQ-permitted sewage systems present within the existing mine facilities.

Maintenance and lubrication of most of the equipment takes place at existing shop facilities at the Buckskin Mine. Major lubrication, oil changes, and other maintenance operations for most equipment are performed inside the service building bays. Used oil and grease are contained and deposited in storage tanks in that building. All collected used oils and grease are then beneficially recycled off site or used for energy recovery.

The Buckskin Mine has reviewed the EPA's "Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Re-authorization Act (SARA) of 1986 (as amended)" and the EPA's "List of Extremely Hazardous Substances," as defined in 40 CFR 355 (as amended), for hazardous substances used at the mine. Hazardous substances are designated under Section 102 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended; extremely hazardous substances are listed in Section 302 of the Emergency Planning and Community Right to Know Act. The mine maintains files containing Material Safety Data Sheets for all chemicals, compounds, and/or substances that are or would be used during the course of mining.

The Buckskin Mine is responsible for ensuring that all production, use, storage, transport, and disposal of hazardous and extremely hazardous materials that occur as a result of mining activities are in accordance with all applicable existing or future federal, state, and local government rules, regulations, and guidelines. All mining activities involving the production, use, and/or disposal of hazardous or extremely hazardous materials are and would continue to be conducted to minimize potential environmental impacts.

The mine must also comply with emergency reporting requirements for releases of hazardous materials. Any release of hazardous or extremely hazardous substances in excess of the reportable quantity, as established in 40 CFR 117, is reported as required by CERCLA, as amended. The materials for which such notification must be given are listed in Section 302 of the Emergency Planning and Community Right to Know Act and Section 102 of CERCLA, as described above. If a reportable quantity of a hazardous or extremely hazardous substance is released, immediate notice is given to the WDEQ and all other appropriate federal and state agencies.

Each mining company is expected to prepare and implement several plans and policies to ensure environmental protection from hazardous and extremely hazardous materials. These plans/policies include:

- spill prevention control and countermeasure plans;
- spill response plans;
- stormwater pollution prevention plans;
- inventories of hazardous chemical categories pursuant to Section 313 of SARA, as amended; and
- emergency response plans.

In addition, all mining operations must comply with regulations promulgated under the Resource Conservation and Recovery Act, Federal Water Pollution Control Act (Clean Water Act), Safe Drinking Water Act, Toxic Substances Control Act, Mine Safety and Health Act, and the CAA. In addition, mining operations must comply with all attendant state rules and regulations relating to hazardous material reporting, transportation, management, and disposal.

Compliance with these regulations is the current practice at the Buckskin Mine. Kiewit's acquisition of the proposed tract or alternative tract configuration would not change these practices, nor the type and quantity of any wastes generated and disposed of by the mine.

1.2 Purpose and Need for Action

As described in section 1.1.1, the purpose of the Proposed Action is to extend the life of existing operations at the Buckskin Mine. The Proposed Action would not expand operations at the Buckskin Mine, but would maintain current levels of production and extend the life of the mine by approximately two years[3]. The permitting process that follows the lease sale takes approximately five years to complete. Kiewit is applying for the federal coal reserves in the proposed tract now so that it can secure coal resources to market, enter into new contracts, and complete the permitting process in time to mine the new lease in a logical progression.

More broadly, the Proposed Action responds to the continued demand for coal in the United States, primarily for the purpose of generating electricity. According to the U.S. Energy Information Administration (2008a), the United States has the world's largest known coal reserves. Demand for this coal is driven by the electric power sector, which accounts for about 92% of coal consumption (U.S. Energy Information Administration 2008a, 2008b). Approximately half of the electricity currently generated in the United States comes from coal (U.S. Department of Energy 2009a). Wyoming coal is used to generate electricity in 37 other states (Wyoming Mining Association 2009).

The Energy Policy Act of 2005 directs federal agencies to undertake efforts to ensure energy efficiency and the production of secure, affordable, and reliable domestic energy. A primary goal of the National Energy Policy is to increase domestic energy supplies from diverse sources such as oil, gas, coal, hydropower, wind, solar, and nuclear power in a long-term effort to reduce the United States' dependence on foreign energy sources. The BLM recognizes that the continued extraction of coal is essential to meet the nation's future energy needs and goals. Consequently, private development of federal coal reserves is integral to the BLM's coal leasing program under the authority of the Mineral Leasing Act of 1920, as well as the Federal Land Policy Management Act (FLPMA) and the Federal Coal Leasing Amendments Act of 1976. Under FLPMA, the BLM is mandated to manage public lands for multiple-use so that the lands are utilized in the combination that will best meet the present and future needs of the American people. FLPMA authorizes the BLM to manage the use, occupancy, and development of public lands through leases and permits (43 CFR 2710).

Management—leasing, mining, and selling—of federal coal resources in the PRB contributes to a reliable supply of coal for electric power generation in the United States. The low-sulfur compliance coal from the PRB enables coal-fired power plants to meet current CAA requirements and increasing demand without potentially significant increases in power costs

[3] Assuming that coal production would continue at the most recent (2008) average annual coal production rate of 25 million tons per year.

while new technologies are developed to improve efficiency and reduce emissions. Management of federal coal resources in the PRB also generates revenue—in the form of bonus, annual rental, and royalty payments—that is used to fund numerous infrastructure and social projects in Wyoming.

1.3 Regulatory Authority and Responsibility

The authorities and responsibilities of the BLM and other concerned regulatory agencies are described in this section, including a detailed description of the permitting process that follows BLM leasing of federal coal reserves.

The Hay Creek II application was submitted and will be processed and evaluated under the following federal authorities:

- Mineral Leasing Act of 1920, as amended;
- Multiple-Use Sustained Yield Act of 1960;
- National Environmental Policy Act;
- Federal Coal Leasing Amendments Act of 1976;
- Federal Land Policy Management Act; and
- Surface Mining Control and Reclamation Act of 1977 (SMCRA).

As described previously, the BLM is the lead agency responsible for leasing federal coal reserves under the Mineral Leasing Act of 1920, as amended by the Federal Coal Leasing Amendments Act in 1976. The BLM is also responsible for preparing this EIS to evaluate the potential environmental impacts of issuing a coal lease and the subsequent mining of that coal, which would be the logical outcome of any leasing action. As part of the EIS and leasing processes, the BLM also has a responsibility to consult with and obtain the comments and assistance of cooperating agencies, such as the OSM and WDEQ, as well as other state and federal agencies that have jurisdiction by law or special expertise with respect to potential environmental impacts.

After a federal coal lease is issued, the SMCRA gives the OSM primary responsibility to administer programs that regulate surface coal mining operations, as well as the surface effects of underground coal mining operations. Pursuant to Section 503 of the SMCRA, the WDEQ developed a permanent program authorizing that agency to regulate surface coal mining operations and surface effects of underground mining on nonfederal lands within Wyoming. In November 1980, the Secretary of the Interior approved that program. In January 1987, pursuant to Section 523(c) of the SMCRA, the WDEQ entered into another cooperative agreement with the Secretary of the Interior authorizing the WDEQ to regulate surface coal mining operations and surface effects of underground mining on federal lands within the state; no federal surface is included in any of the analysis areas for the Hay Creek II EIS.

The net result of those actions was to give the WDEQ the authority to serve as an agent of the OSM to issue permits to mine coal in Wyoming. Before a newly leased area can be disturbed, the lessee must submit an extensive permit application package to the WDEQ to amend the current permit document to include any proposed coal mining and reclamation operations associated with the newly leased coal reserves. That agency acts as the conduit for distributing the package to other divisions within the WDEQ, as well as other state and federal agencies with a vested interest or cooperator status in the permitting process and future impacts of mining.

The WDEQ carefully reviews the permit application package to ensure that it complies with the permitting requirements, and that the coal mining operation will meet the performance standards of the approved Wyoming program. The BLM and other state and federal agencies also review the application package to ensure that it complies with the terms of the coal lease, applicable state requirements, the Mineral Leasing Act, NEPA, and other state and federal laws and their associated regulations.

If the permit application package complies, the WDEQ issues a permit to the applicant to conduct coal mining operations. The final permit application document and the actual permit are then submitted to OSM, which recommends approval, approval with conditions, or disapproval of the Mineral Leasing Act mining plan to the Assistant Secretary of the Interior, Land and Minerals Management. Before the mining plan can be approved, the BLM must approve the Resource Recovery Protection Plan for mining the tract.

If a proposed LBA tract is leased to an existing mine, the lessee is required to revise its coal mining permit before the coal can be extracted, following the processes outlined above. As a part of that process, a detailed new plan must be developed showing how the newly leased lands would be mined, mitigated, and/or reclaimed. The total disturbance area typically exceeds the leased area because of the need for mine support activities, described in section 1.1.3.3. As noted, the mining, mitigation, and reclamation plans must all be approved by appropriate state and federal agencies before mining can proceed in newly leased coal tracts. All special provisions within the existing permit document, such as species-specific protective measures for plant and animal species of concern, also apply to additional lands within new coal tracts.

The WDEQ enforces the performance standards and permit requirements for reclamation during a mine's operation and has primary authority in environmental emergencies. The OSM retains oversight responsibility over the WDEQ for this enforcement. Appendix A presents other federal and state permitting requirements that must be satisfied to mine the proposed tract.

1.4 Relationship to BLM Policies, Plans, and Programs

In addition to the federal acts listed under section 1.3, guidance and regulations for managing and administering public lands—including the federal coal reserves in the Kiewit application—are set forth in 40 CFR 1500 (Protection of Environment), 43 CFR 1601 (Planning, Programming, Budgeting), and 43 CFR 3400 (Coal Management).

Specific guidance for processing applications follows BLM Manual 3420, Competitive Coal Leasing (BLM 1989) and the 1991 *Powder River Regional Coal Team Operational Guidelines for Coal Lease-By-Applications* (BLM 1991). The *National Environmental Policy Act Handbook* (BLM 2008b) has been followed in developing this EIS.

1.5 Conformance with Existing Land Use Plans

The Federal Coal Leasing Amendments Act of 1976 requires that lands considered for leasing be included in a comprehensive land use plan and that leasing decisions be compatible with that plan. The BLM *Approved Resource Management Plan (RMP) for Public Lands Administered by the Bureau of Land Management Buffalo Field Office* (BLM 2001), governs and addresses the leasing of federal coal in Campbell County. The 2001 document is an update of the previous *Buffalo Resource Area RMP* (BLM 1985), and will be referred to as the 2001 RMP update throughout this EIS.

The major land use planning decision that the BLM must make concerning federal coal resources is a determination of which coal reserves are acceptable for further consideration for leasing. The BLM uses four screening procedures to identify these coal reserves. These screening procedures require the BLM to:

- estimate the development potential of the federal coal reserves;
- apply the unsuitability criteria listed in the regulations at 43 CFR 3461;
- make decisions related to multiple land uses that eliminate federal coal deposits from consideration for leasing to protect other resource values; and
- consult with surface owners who meet the criteria defined in the regulations at 43 CFR 3400.0-5(gg)(1) and (2).

Only those federal coal reserves that pass these screens receive further consideration for leasing. The BLM has applied these coal screens to federal coal reserves in Campbell County several times, beginning in the early 1980s. In 1993, the BLM began the most recent process of reapplying these screens in Campbell, Converse, and Sheridan counties in eastern Wyoming. This screening analysis process, which includes the portion of Campbell County where the proposed tract is located, was adopted in the 2001 RMP update, and the results were included as Appendix D of that update. That document can be viewed in the 2001 documents section on the Wyoming BLM website at: http://www.blm.gov/rmp/WY/application/index.cfm/rmpid=101.

Under the first coal screening procedure, a coal tract must be located within an area that has been determined to have coal development potential in order to be acceptable for further consideration for leasing (43 CFR 3420.1-4(e)(1)). In the coal screening analyses published in its 2001 RMP update, the BLM identified the proposed tract as being in an area with this coal development potential.

The second screening procedure requires the application of coal mining unsuitability criteria listed in the federal coal management regulations (43 CFR 3461). The coal mining unsuitability criteria were applied to lands in the PRB with high to moderate coal development potential, including the proposed tract and adjacent coal reserves identified by the BLM, during the coal screening conducted for the 2001 RMP update. Appendix B of this EIS summarizes the unsuitability criteria, describes the general findings for the 2001 RMP update, and presents a validation of these findings for the proposed tract, as well as adjacent unleased federal coal reserves. Chapter 2 provides detailed descriptions of the proposed tract and those adjacent coal reserves, as well as the result of the review of the unsuitability criteria specific to both areas. As indicated in appendix B, several criteria will be further evaluated during the leasing process.

The third coal screening procedure consists of a conflict analysis for multiple-use activities on the lands associated with the coal reserves that are under consideration for leasing. In accordance with 43 CFR 3420.1-4(e)(3), that analysis must be completed to identify and "eliminate additional coal deposits from further consideration for leasing to protect resource values of a locally important or unique nature not included in the unsuitability criteria." The 2001 RMP update addresses two types of multiple land-use conflicts: municipal/residential conflicts and multiple mineral development (coal versus oil and gas) conflicts. The proposed tract does not lie within or near an identified buffer zone surrounding an existing community; therefore, no federal coal reserves within that tract configuration have been eliminated from further consideration for leasing due to municipal/residential conflicts.

The 2001 RMP update includes two decisions related to multiple mineral development conflicts in Campbell, Converse, and Sheridan counties. With respect to oil and gas leasing in coal mining areas, it determined that oil and gas tracts that would interfere with coal mining operations would not be offered for lease but that, where possible, oil and gas leases would be issued with specific conditions to prevent a development conflict with coal mining operations. With respect to coal leasing in oil and gas fields, the 2001 RMP update states that coal leasing in producing oil and gas fields would be deferred unless or until coal development would not interfere with the economic recovery of the oil and gas resources, as determined on a case-by-case basis.

The BLM's evaluation of the potential for conflict with the development of oil and gas resources within the proposed tract is discussed in section 3.3. The BLM's policy and guidance on conflicts between surface coal mining and CBNG development is to optimize the recovery of both resources and to ensure that the public receives a reasonable return, as explained in BLM Instruction Memorandum No. 2006-153 (BLM 2006a).

The fourth coal screening procedure requires consultation with surface owners who meet the criteria defined in the regulations at 43 CFR 3400.0-5(gg)(1) and (2)[4]. Surface owner consultation was conducted as part of the coal screening analyses published in the 2001 RMP update. Private surface owners in the Gillette coal development potential area (including Campbell County and northern Converse County) were provided the opportunity to express their preference for or against surface mining of federal coal under their private surface estate during that screening. At that time, no attempt was made to distinguish qualified surface owners. Appendix D of the 2001 RMP update states that "no area should be dropped from further consideration for leasing as a result of responses received from surface owners." Therefore, no federal coal reserves within the proposed tract have been eliminated from further consideration for leasing due to qualified surface owner conflicts at this time.

Private surface owners who are found to be qualified must consent to leasing before the BLM can offer the underlying federal coal reserves for lease. The BLM will review the current surface ownership in the final tract configuration. Prior to offering any tract for lease, consent to leasing must be provided for any lands held by any qualified surface owner.

In summary, the proposed tract has been subjected to the four coal planning screens and determined acceptable for further consideration for leasing. Thus, a decision to lease the federal coal reserves in this application would be in conformance with the 2001 RMP update.

1.6 Consultation and Coordination

1.6.1 Initial Involvement

The BLM received the Hay Creek II coal lease application on March 24, 2006. The BLM, Wyoming State Office, Division of Minerals and Lands, initially reviewed the application and ruled that the application and lands involved met the requirements of regulations governing coal leasing on application (43 CFR 3425).

On September 18, 2006, the BLM Wyoming State Director notified the Governor of Wyoming that Kiewit had filed a lease application with the BLM for the proposed tract. The PRRCT reviewed this lease application at a public meeting held in Casper, Wyoming, on April 19, 2006, following Kiewit's presentation about the existing Buckskin Mine and the pending lease application for the proposed tract. The PRRCT recommended that the BLM continue to process this application. The major steps in processing a coal LBA, including permitting steps once the lease is issued, are shown in appendix C.

The BLM published a notice of intent to prepare an EIS and a notice of public meeting in the *Federal Register* on Friday, December 21, 2007. The publication announced the time and location of a public scoping meeting and requested public comment on the application. Letters

[4] Chapter 7 includes a definition of the term "qualified surface owner," based on these regulations.

requesting public comment and announcing the time and location of the public scoping meeting were mailed to all parties on the distribution list.

The BLM published a notice of public scoping meeting in the *Federal Register* and Gillette *News-Record* newspaper. A BLM news release announcing preparation of the Hay Creek II coal lease application EIS was issued on January 17, 2008. The public scoping meeting was held on January 31, 2008, in Gillette, Wyoming. At the public meeting, the BLM presented information and accepted public comments about the application.

Chapter 5 provides a list of all federal, state, and local governmental agencies that were consulted in preparation of this EIS, all contributors to and reviewers of the information provided in this document, and the distribution list for this EIS.

1.6.1.1 *Issues and Concerns*

Issues and concerns expressed by the public and government agencies relating to the potential impacts of leasing the proposed tract, specifically, and/or to previous coal lease applications in general include:

- potential conflicts between coal mining and both existing and proposed conventional oil and gas development and CBNG development;
- potential cumulative impacts of coal leasing decisions combined with other existing and proposed development in the PRB;
- validity and currency of resource data;
- potential impacts on public access;
- potential impacts on cultural and paleontological resources;
- potential impacts on greater sage-grouse and other wildlife;
- potential impacts on threatened and endangered species and other species of concern;
- potential impacts on wetland resources;
- potential impacts related to coal loss during transport;
- potential impacts on air quality (including cumulative impacts on visibility);
- potential impacts on surface and groundwater quality and quantity;
- potential impacts of and possible mitigation for nitrogen oxide emissions resulting from blasting of coal and overburden;
- potential impacts on human health;
- the need to include reasonably foreseeable actions such as the construction and operation of the Dakota, Minnesota & Eastern Railroad and power plants in the cumulative analysis;
- the need to address coal combustion residues and other byproducts from coal-fired power plants;

- the need to address increasing coal production in the PRB in the cumulative analysis;
- the need to lease enough coal that the revenues generated are sufficient for use in the local community;
- the need to address site-specific greenhouse gas emissions; and
- climate change.

1.6.1.2 *Draft Environmental Impact Statement*

Copies of the draft EIS were sent to all parties on the distribution list and copies were made available for review at the BLM offices in Casper, Buffalo, and Cheyenne, Wyoming. The document was also made available for review on the BLM Wyoming website at: http://www.blm.gov/wy/st/en/info/NEPA/cfodocs/HayCreekII.html.

The EPA published a notice in the *Federal Register* on March 12, 2010, announcing the availability of the draft EIS. A 60-day comment period on the draft EIS commenced with publication of that notice. The BLM also published a notice of availability/notice of public hearing in the *Federal Register* on March 12, 2010. That notice announced the date and time of a public hearing to be held during the 60-day comment period. The purpose of the hearing, held in Gillette, Wyoming on April 22, 2010, was to solicit public comments on the draft EIS and on the fair market value, maximum economic recovery, and proposed competitive sale of federal coal from the proposed tract. The BLM also published a notice of public hearing in the *Gillette News-Record* and other local newspapers.

1.6.1.3 *Final Environmental Impact Statement*

All substantive written comments received on the draft EIS have been included, with corresponding responses from the BLM, in appendix D of this final EIS. Both the BLM and the EPA will publish a notice of availability of the final EIS in the *Federal Register*. After a 30-day availability period, the BLM will make a decision to hold or not to hold a competitive lease sale for the federal coal reserves within the LBA area.

1.6.2 Future Involvement

1.6.2.1 *Record of Decision*

The record of decision (ROD) for the tract is mailed to all parties on the mailing list and others who commented on the draft EIS during the comment period. Members of the public and/or the applicant can appeal the BLM decision to hold or not to hold a competitive sale and issue a lease for the final tract configuration. An appeal of the BLM's decision must be filed within 30 days from the date that the notice of availability for the ROD is published in the *Federal Register*. The decision can be implemented at the end of the 30-day appeal period, if no appeal is received. If a competitive lease sale is held, it will follow the procedures set forth in 43 CFR 3422, 43 CFR 3425, and BLM Handbook H-3420-1 (Competitive Coal Leasing).

1.6.2.2 *U.S. Department of Justice Consultation*

After a competitive coal lease sale is held, but before the lease is issued, the BLM must solicit the opinion of the U.S. Department of Justice on whether the planned lease issuance creates a situation inconsistent with federal antitrust laws. The Department of Justice has 30 days to make this determination. If the Department of Justice has not responded in writing within the 30 days, the BLM can issue the lease.

2.0 PROPOSED ACTION AND ALTERNATIVES

This chapter describes the regulations and documents that guide the identification of alternatives to the Proposed Action, explains how the alternatives were developed and how a final tract configuration will be determined, and, finally, provides detailed descriptions of the Proposed Action, alternatives, and tract configurations considered in this EIS[1].

This final EIS analyzes three alternatives: the Proposed Action, Alternative 1 (No Action), and Alternative 2 (additional lands added by the BLM). Two additional alternatives were considered but were not analyzed further in this EIS because they were either not logistically feasible (Alternative 3—new mine start) or substantially different (Alternative 4—delay the lease sale) than analyzed alternatives. Supporting information for excluding these alternatives is provided in section 2.3.

The BLM selected Alternative 2 as the Preferred Alternative after considering all of the input received on the draft EIS from individuals, agencies, and other interested parties during the public comment period. The comment period began upon the BLM's issuance of a notice of availability of the draft EIS on March 12, 2010, and lasted for 60 days. This process offered the public sector an opportunity to submit written input during the comment period and oral comments at a public hearing that occurred on April 22, 2010. In addition to comments on the environmental effects described in the draft EIS, the BLM considered fair market value and maximum economic recovery factors, geologic data, and coal data when identifying the Preferred Alternative presented in this final EIS. Following a 30-day public comment period on the final EIS, the BLM will issue a ROD. The ROD will define the final delineation of the Hay Creek II tract. Based on federal regulations (43 CFR 3425.1-9)[2], the final coal lease tract can be any configuration that is within the area analyzed for this EIS, as described in section 2.2.3 and chapter 3. If the BLM decides to offer the tract for lease, then a sale will be held. If a sale is held, the bidding would be open to any qualified bidder.

2.1 Background

To process an LBA, the BLM must evaluate the quantity, quality, maximum economic recovery, and fair market value of the federal coal, and fulfill the requirements of NEPA by evaluating the environmental impacts of leasing that coal. NEPA also requires that the BLM consider and evaluate "reasonable alternatives" to meet the objectives of the Proposed Action while avoiding or minimizing environmental impacts. Reasonable alternatives are defined by NEPA as those that are technically, economically, and environmentally practical and feasible to satisfy the stated purpose and need for the proposed federal action. NEPA also requires the analysis of a "no

---

1 Refer to page xx for a list of abbreviations and acronyms used in this document.

2 "The authorized officer may add or delete lands from an area covered by an application for any reason he/she determines to be in the public interest."

action" alternative (i.e., the consequence of continuing ongoing activities without a new leasing action).

In addition to NEPA requirements, the BLM must meet the requirements contained in the *Competitive Coal Leasing Manual* (BLM 1989) and follow the regulations for federal coal leasing by application under 43 CFR 3425. Like NEPA, the *Competitive Coal Leasing Manual* requires that the BLM evaluate other potential boundaries for federal coal tracts that include and/or are near the proposed tract.

In its consideration of alternative tract boundaries, the BLM must meet the following goals: 1) achieve maximum economic recovery of the coal resource; 2) maintain or increase the potential for competition; and 3) avoid future bypass or captive tract situations (i.e., stranding an isolated tract and hindering future recovery of those coal resources). In accordance with these goals, the BLM has identified an area encompassing the proposed tract and adjacent unleased federal coal reserves. This area is referred to as the BLM study area (map 2-1). As described under section 2.0, the BLM could decrease the size of the proposed tract or increase it to include some or all of the federal coal reserves in the BLM study area.

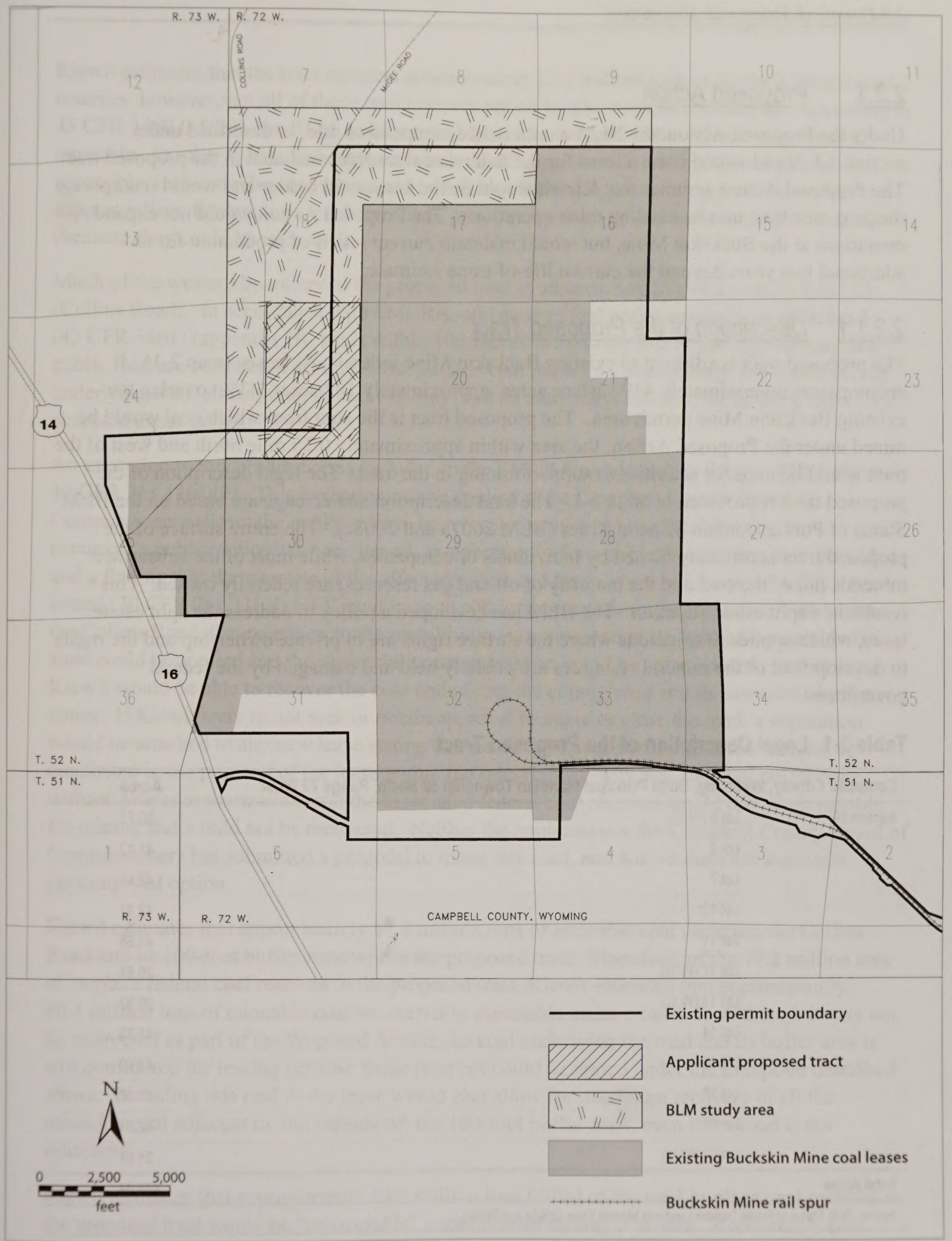
2.2 Description of the Proposed Action and Alternatives

Under the Proposed Action, the BLM would hold a competitive sale and issue a lease for the federal coal reserves included in the proposed tract, which is a contiguous block of federal coal reserves adjacent to existing coal leases at the Buckskin Mine (map 2-1). Two alternatives to the Proposed Action are analyzed in this EIS:

1. Alternative 1 (No Action): Reject the application to lease federal coal reserves in the proposed tract and not offer a tract for sale at this time.
2. Alternative 2 (the BLM Preferred Alternative): Hold a competitive sale and issue a lease for the federal coal reserves included in an alternative tract configuration that would be delineated from some or all of the BLM study area.

See section 2.3 for a discussion of other alternatives considered but eliminated from further analysis in this EIS.

Under the Proposed Action or Alternative 2, the Buckskin Mine permit area would be enlarged to include the newly leased tract before mining activities could begin. To do this, Kiewit would submit an application to the WDEQ to amend its existing surface mining permit and mining plan, including corresponding monitoring, reclamation, and mitigation plans, to include the new lease area.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 2-1

Applicant Proposed Tract and BLM Study Area

2.2.1 Proposed Action

Under the Proposed Action, the BLM would hold a competitive sale, as described under section 1.1.2, and would issue a lease for the federal coal reserves included in the proposed tract. The Proposed Action assumes that Kiewit would be the successful bidder and would incorporate the proposed tract into its existing mine operations. The Proposed Action would not expand operations at the Buckskin Mine, but would maintain current levels of production for an additional two years beyond the current life-of-mine estimate.

2.2.1.1 Description of the Proposed Tract

The proposed tract is adjacent to existing Buckskin Mine federal coal leases (map 2-1). It encompasses approximately 419 surface acres; approximately 182 acres (43%) overlap the existing Buckskin Mine permit area. The proposed tract is the area from which coal would be mined under the Proposed Action; the area within approximately 0.25 mile north and west of the tract would be used for activities to support mining in the tract. The legal description of the proposed tract is provided in table 2-1. The land description and acreage are based on the BLM Status of Public Domain Mineral Titles (BLM 2007a and 2008c). The entire surface of the proposed tract is privately owned by individuals or companies, while most of the subsurface minerals (all of the coal and the majority of oil and gas reserves) are federally owned. This results in a split estate situation. The BLM has developed a policy to address the split estate issue, which applies to situations where the surface rights are in private ownership and the rights to development of the mineral resources are publicly held and managed by the federal government.

Table 2-1. Legal Description of the Proposed Tract

Campbell County, Wyoming, Sixth Principal Meridian Township 52 North, Range 72 West		Acres
Section 19:	Lot 5 (W ½)	20.71
	Lot 6	41.42
	Lot 7	42.45
	Lot 10	42.31
	Lot 11	41.68
	Lot 12 (W ½)	20.84
	Lot 13 (W ½)	20.93
	Lot 14	41.75
	Lot 15	41.90
	Lot 18	41.97
	Lot 19	42.01
	Lot 20 (W ½)	21.07
Total Acres		**419.04**

Source: BLM Status of Public Domain Land and Mineral Titles (2007a and 2008c).

Kiewit estimates that the tract contains approximately 77.2 million tons of in-place federal coal reserves; however, not all of those coal reserves are currently considered mineable. According to 43 CFR 3480.0-5(23), the BLM defines minable coal as the reserve base that is commercially mineable. In other words, mineable coal includes all reserves that are legally and physically accessible, including the coal that would be left in place during the mining process, such as support pillars, fenders (i.e., catch benches), property barriers, or coal underlying public roads (because they could be relocated).

Much of the western boundary of the proposed tract is adjacent to Campbell County Road 23 (Collins Road). In accordance with SMCRA, and as specified under unsuitability criterion 3 (43 CFR 3461) (appendix B), lands within 100 feet of the outside line of the right-of-way of a public road are considered unsuitable for surface coal mining. Consequently, the coal reserves underlying the Collins Road, its right-of-way, and an associated 100-foot buffer zone cannot be accessed under current conditions.

An exception to this prohibition is included in the SMCRA regulations at Section 522(e)(4) and 30 CFR 761.11(d)(2). This exception can be applied if the Campbell County Board of Commissioners allows the public road to be relocated or closed after the following have occurred: a public notice has been issued, an opportunity for a public hearing has been provided, and a finding that the interests of the affected public and landowners will be protected has been issued (30 CFR 761.11[d]). If Kiewit were to obtain approval from the commissioners to move the Collins Road, the exception to the prohibition on mining within its right-of-way and buffer zone could be applied and the unsuitability determination could be reconsidered. In that case, Kiewit would be able to recover the coal underlying the county road and its associated buffer zones. If Kiewit were to not seek or obtain approval to move or close the road, a stipulation would be attached to any new lease stating that no mine-related surface disturbance may be conducted in the portions of the lease within the road right-of-way and 100-foot buffer zone without proper authorization, and the associated federal coal reserves would remain unsuitable for mining and would not be recovered. Neither the applicant nor the Campbell County Board of Commissioners has submitted a proposal to move this road, and Kiewit does not anticipate pursuing that option.

Kiewit estimates that approximately 17.1 million tons of mineable coal underlies the Collins Road and its 100-foot buffer zone within the proposed tract. Therefore, of the 77.2 million tons of in-place federal coal reserves in the proposed tract, Kiewit estimates that approximately 60.1 million tons of mineable coal are currently accessible under criteria 3. Although it may not be recovered as part of the Proposed Action, the coal underlying the road and its buffer area is still considered for leasing because those reserves could be mined under the exception described above. Including this coal in the lease would also allow for maximum recovery of all the mineable coal adjacent to, but outside of, the 100-foot buffer zone, even if the road is not relocated.

Kiewit estimates that approximately 54.1 million tons (70%) of the total in-place coal reserves in the proposed tract would be "recoverable" under normal mining practices. Recoverable coal

reserves are defined in 43 CFR 3480.0-5(32) as the minable reserve base excluding all coal that would be left in place during the mining process, even though they might be physically accessible (i.e., mineable). Recoverable coal represents reserves that can be mined economically and excludes areas defined as unsuitable for mining (e.g., in road rights-of-way that are not relocated) as well as the coal that is left behind as support pillars and similar structures, or unavoidably lost through cleaning, loading, and hauling (e.g., spillage), and spontaneous natural fires.

The BLM independently evaluates the volume and average quality of the coal resources included in proposed LBA tracts as part of the fair market value determination process. The agency's estimate of the mineable federal coal reserves included in the proposed tract may not agree precisely with the mineable coal reserve and coal quality estimates provided by the applicant. However, the BLM estimate would be published in the official notice if the tract is offered for sale.

Under its currently approved mining plan, the Buckskin Mine would retrieve its remaining 344.3 million tons of recoverable coal reserves in approximately 14 years, beginning in January 2009. The mine's current air quality permit as approved by the WDEQ allows mining of as much as 42 million tons of coal per year. Annual production averaged 20.6 million tons from 2001 through 2008, with a maximum of 25.3 million tons in any single year (Buckskin Mining Company 2002, 2003, 2004, 2005, 2006, 2007, 2008, and 2009). Under the Proposed Action, Kiewit estimates that the life of the mine would be extended by an additional two years, with a continued average production rate of 25 million tons per year. Additional details about existing coal reserves and tons mined to date are provided in section 1.1.3.1.

2.2.1.2 Mine Facilities and Employees

Under the Proposed Action, the recovery of additional federal coal reserves would use the existing mine facilities and employees described under section 1.1.3.2. The Proposed Action would not require additional facilities or employees.

2.2.1.3 Mining Methods and Activities

Under the Proposed Action, coal would continue to be produced at the Buckskin Mine from the Anderson and Canyon coal seams, and current production methods would be the same as those described under section 1.1.3.3.

The design of the Buckskin Mine seeks to confine disturbance to the active mine blocks. Before any surface disturbance or other mine-related activities would begin in the proposed tract, support infrastructure such as roads, power lines, gas pipelines, and flood- and sediment-control features would be built or relocated, as needed; no public roads are currently being considered for construction or relocation. Topsoil and overburden removal is accomplished using a variety of suitable heavy equipment. Whenever possible, topsoil would be hauled directly to a reclamation area and overburden to open pits; however, if scheduling conflicts arise, they would be temporarily stockpiled in separate areas and topsoil piles would be seeded immediately to

prevent erosion. Overburden and coal removal have been and would continue to be conducted using blasting and truck/shovel fleets to facilitate efficient excavation.

2.2.1.4 Reclamation Activities

Reclamation activities under the Proposed Action would be consistent with those currently in use at the Buckskin Mine, described in section 1.1.3.4.

Mined-out areas would be reclaimed according to an approved postmine plan. Any affected streams would be reclaimed to follow premine drainage patterns (section 3.5). In-channel stockponds and playas (shallow topographic depressions) would be replaced to provide livestock and wildlife watering sources. All postmining topography, including reconstructed drainages, must be approved by the WDEQ. After mining, the land is reclaimed to support the premining uses described in section 1.1.3.1. Oil and gas wells, pipelines, and utility easements are reestablished as required.

All reclaimed areas are monitored for a minimum of 10 years to evaluate the success of vegetation growth and the establishment of a variety of native plant species prior to the final (Phase III) release of the reclamation bond. Other parameters, such as successful use of reclaimed areas by domestic livestock and wildlife, also must be demonstrated before Phase III bond release is achieved, as described in section 1.1.3.4.

2.2.2 Alternative 1 (No Action)

Under Alternative 1, the No Action Alternative, Kiewit's application to lease the coal included in the proposed tract would be rejected: federal coal reserves adjacent to the existing Buckskin Mine would not be offered for competitive sale, and the additional coal would not be mined.

For the purposes of this EIS, Alternative 1 assumes that the federal coal reserves in the proposed tract adjacent to the Buckskin Mine would not be mined in the foreseeable future. However, selection of this alternative would not preclude Kiewit or another company from submitting a future lease application for these coal reserves. These coal reserves could be leased as a maintenance tract while the Buckskin Mine is in operation. If it is not leased while the mine is active, it may or may not be leased in the future. The proposed tract evaluated in this EIS does not include enough coal reserves to justify starting a new mine (section 2.3.1); however, they could be combined with unleased federal coal reserves to the west and north to create a larger tract, which could be mined by a new operation in the future.

Under Alternative 1, average annual production would continue as described under section 1.3.1.1;

- mine facilities and employees would be the same as described under section 1.1.3.2;
- mining methods and activities would continue as described under section 1.1.3.3; and
- reclamation activities would continue as described under section 1.1.3.4.

2.2.3 Alternative 2 (BLM Preferred Alternative)

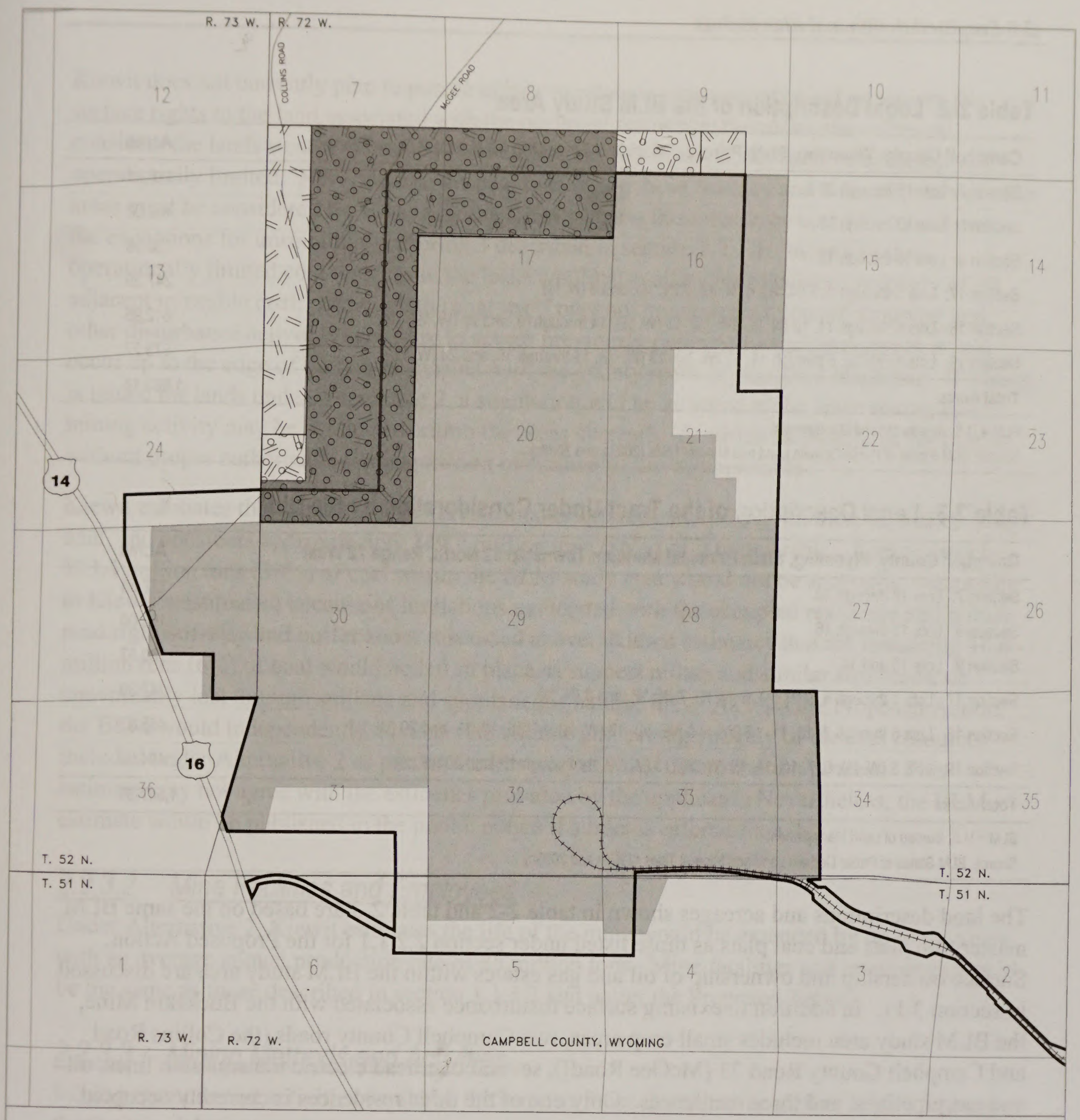
The BLM has identified Alternative 2 as its Preferred Alternative for the final EIS. Under that alternative, the BLM is considering a tract configuration that is larger than both Kiewit's proposed tract and original (2006) tract, but smaller than the BLM study area (map 2-2). The legal descriptions of the BLM study area and the tract under consideration by the BLM are provided in table 2-2 and table 2-3, respectively. As described in section 2.0, the BLM will define the final tract delineation in the ROD based on lands within the BLM study area. The final tract configuration could be smaller or larger than the proposed tract. The final tract configuration could include part or all of the BLM study area. The tract will be considered to be technically, environmentally and economically in the public's best interest. Because the final tract configuration will be within the BLM study area, and the entire study area was analyzed in this EIS, no further discussion of Kiewit's original (2006) tract or the tract under consideration by the BLM will be included in this EIS beyond table 2-3.

Alternative 2 also assumes that Kiewit would be the successful bidder, and would incorporate a tract configuration other than Kiewit's proposal into its existing mine operations. Alternative 2 would not expand operations at the Buckskin Mine, but would maintain current levels of production, described in section 1.1.3.1, for up to six years beyond the current life-of-mine estimate.

2.2.3.1 Description of the BLM Study Area and Tract under Consideration by the BLM

The BLM study area extends north and west of the proposed tract to encompass approximately 1,883 acres (map 2-1). Approximately 618 acres (33%) of the BLM study area overlap the existing mine permit area. The legal description of the BLM study area is provided in table 2-2. Under this alternative, mining would occur in an alternative tract configuration within the BLM study area; the area within approximately 0.25 mile north and west of the alternative tract configuration would be used for activities to support mining in the tract.

The tract under consideration by the BLM extends north and west of the proposed tract, and encompasses approximately 1,568 acres. The legal description of this tract is provided in table 2-3. As with other configurations, the area within approximately 0.25 mile north and west of the tract under consideration by the BLM would be used for activities to support mining in that tract. The tract under consideration by the BLM was analyzed in the final EIS as part of the larger BLM study area; therefore, that tract is not discussed separately beyond table 2-3.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 2-2

BLM Tract under Consideration and Applicant Original (March 2006) Tract

Table 2-2. Legal Description of the BLM Study Area

Campbell County, Wyoming, Sixth Principal Meridian Township 52 North, Range 72 West	Acres
Section 7: Lots 17 through 20	166.91
Section 8: Lots 13 through 16	162.00
Section 9: Lots 13 through 15	120.58
Section 17: Lots 1 through 4, 5 (N. ½), 6 (N. ½), 7 (N. ½), and 8 (N. ½)	247.39
Section 18: Lots 5 through 11, 12 (N. ½, SW. ¼), 13 (W. ½), 14 through19, and 20 (W. ½)	612.95
Section 19: Lots 5 (W. ½), 6 through 11, 12 (W. ½), 13 (W. ½), 14 through 19, and 20 (W. ½)	573.27
Total Acres	**1,883.10**

BLM = U.S. Bureau of Land Management

Source: BLM Status of Public Domain Land and Mineral Titles (2007a and 2008c).

Table 2-3. Legal Description of the Tract Under Consideration by the BLM

Campbell County, Wyoming, Sixth Principal Meridian Township 52 North, Range 72 West	Acres
Section 7: Lots 18 through 20	127.36
Section 8: Lots 13 through 16	162.00
Section 9: Lots 13 and 14	80.57
Section 17: Lots 1 through 4, 5 (N. ½), 6 (N. ½), 7 (N. ½), and 8 (N. ½)	247.39
Section 18: Lots 5 through 7, 10, 11, 12 (W. ½ & NE. ¼), 13 (W. ½), 14, 15, 18, 19, and 20 (W. ½)	455.33
Section 19: Lots 5 (W. ½), 6, 7, 10, 11, 12 (W. ½), 13 (W. ½), 14 through 19, and 20 (W. ½)	494.90
Total Acres	**1,567.55**

BLM = U.S. Bureau of Land Management

Source: BLM Status of Public Domain Land and Mineral Titles (2007a and 2008c).

The land descriptions and acreages shown in table 2-2 and table 2-3 are based on the same BLM master title plats and coal plats as those listed under section 2.2.1.1 for the Proposed Action. Surface ownership and ownership of oil and gas estates within the BLM study area are discussed in section 3.11. In addition to existing surface disturbance associated with the Buckskin Mine, the BLM study area includes small crop areas, two Campbell County roads (the Collins Road and Campbell County Road 73 [McGee Road]), several overhead electric transmission lines, oil and gas pipelines, and three residences. Only one of the three residences is currently occupied.

The coal underlying the Collins and McGee roads and their rights-of-way and associated 100-foot buffer zones have been determined unsuitable for surface coal mining in accordance with SMCRA and as specified under unsuitability criterion 3 (43 CFR 3461), unless the applicant pursues an exception to this prohibition by obtaining authorization to close or relocate one or both roads. Under the same unsuitability criterion, the land underlying the occupied residence, discussed above, is also considered unsuitable for mining. Surface disturbance on this land and a 300-foot buffer around it would be prohibited, unless Kiewit were to purchase the surface rights associated with the residence and its buffer zone.

Kiewit does not currently plan to pursue efforts to relocate either county road or acquire the surface rights to the land associated with the occupied residence; therefore, the company considers the lands west of both roads and around the occupied residence as inaccessible and operationally limited. Nevertheless, the coal underlying these features and their respective buffer areas must be considered for leasing by the BLM because those reserves could be mined under the exceptions for unsuitability criterion 3 described in section 2.2.1.1. Including these operationally limited coal reserves in the lease would also allow for maximum recovery of all adjacent mineable coal. Although the coal itself may not be recovered, topsoil stripping and other disturbance activities necessary to access previously permitted adjacent reserves would occur up to the edge of buffers associated with the county roads or occupied residence. If a lease is issued for lands under Alternative 2, a stipulation will be attached to the lease stating that no mining activity may be conducted within the areas currently identified as unsuitable for mining without proper authorization or acquisition of surface rights, as applicable.

Kiewit estimates that the BLM study area contains approximately 269.7 million tons of in-place coal, and considers approximately 149.7 million tons (56%) of it recoverable. Approximately 103.4 million tons (38%) of coal within the BLM study area would not be accessible (according to Kiewit's estimates) because of limitations associated with the occupied residence and public road rights-of-way and buffer zones discussed above. Kiewit estimates that the remaining 16.6 million tons (6%) of coal would be left in place as support pillars and similar structures, or unavoidably lost through spillage and spontaneous natural fires. As with the Proposed Action, the BLM would independently evaluate the volume and average quality of the coal resources included under Alternative 2 as part of the fair market value determination process. This estimate may not agree with the estimates provided by the applicant. Nevertheless, the BLM estimate would be published in the public notice if a tract is offered for sale.

2.2.3.2 Mine Facilities and Employees

Under Alternative 2, Kiewit estimates the life of the mine would be extended by up to six years with an average annual production rate of 25 million tons. Mine facilities and employees would be the same as those described in section 1.1.3.2 and under the Proposed Action.

2.2.3.3 Mining Methods and Activities

Mining methods and activities would be the same as those described in section 1.1.3.3 and under the Proposed Action.

2.2.3.4 Reclamation Activities

Reclamation activities would be the same as those described in section 1.1.3.4 and under the Proposed Action.

2.3 Eliminated Alternatives

The following alternatives were considered in the initial phase of this EIS, but were eliminated from further analysis.

2.3.1 Alternative 3

Under this alternative, the BLM would hold a competitive, sealed-bid sale for the federal coal reserves included in the proposed tract or an alternative tract configuration. Alternative 3 assumes, however, that the successful bidder would be someone other than the applicant, and that this bidder would plan to open a new mine to develop these coal resources.

The environmental impacts of developing a new mine to recover the coal resources within the proposed tract or an alternative tract configuration would be greater than under either action alternative or the No Action Alternative due to the need for construction of new facilities and rail lines, increased employment requirements and their associated effects on the local socioeconomics, and the creation of additional sources of particulates (dust).

The BLM currently estimates that a tract would need to include as much as 500 to 600 million tons of in-place coal to attract a buyer interested in opening a new mine in the Wyoming PRB. This estimate is based on two primary assumptions. First, an operator would need to construct facilities capable of producing 30 million tons of coal per year to take advantage of the economies of scale offered by the coal deposits in the PRB. Second, 20 to 30 years of coal reserves would be needed to justify the expense of building those facilities. Given these assumptions, neither the proposed tract (approximately 77 million tons) nor the BLM study area (about 270 million tons) includes sufficient in-place coal resources to justify the costs of opening a new mine, though the coal reserves included in this EIS could be combined with unleased federal coal to the west and north to create a larger tract, which could be mined by a new future operation.

A company or companies acquiring this coal for a new stand-alone mine would require considerable initial capital investments, including the construction of new surface facilities (e.g., offices, shops, warehouses, processing facilities, loadout facilities, and rail spur), extensive baseline data collection, and development of new, detailed mining and reclamation plans (rather than simply amending existing plans). A new mine start would also require a large number of new employees, which may not be available from the mining sector workforce (which includes the oil and gas industry) considering the current strong demand for labor and low unemployment in Campbell County and surrounding counties in the PRB. In addition, a company or companies acquiring this coal for a new mine would have to compete for customers with established mines in a competitive market. Based on demand forecasting for the Wyoming PRB mines, existing mine capacity is sufficient to provide for expected coal demand through 2020 (BLM 2005b). While these factors do not mean that no new mines would open, it would be difficult for them to produce coal at a price competitive with the existing operations while also incurring the high capital and start-up costs associated with new facilities and operations.

The potential difficulty in obtaining an air quality permit is another factor that could discourage new mine starts in the Wyoming PRB. A new mine would constitute a new source of air pollutants. Under the WDEQ permitting program, anyone planning to construct, modify, or use a facility capable of emitting designated pollutants into the atmosphere must obtain an air quality permit prior to construction. Surface coal mines fall into this category. Air quality is discussed in detail in section 3.4.

To obtain a construction permit, an operator may be required to demonstrate that the proposed activities would not increase air pollutant levels above the state's 24-hour average annual standards for particulate matter measuring 10 micrometers or less in diameter (PM_{10}). These standards were established by Chapter 6 of the Wyoming Air Quality Standards and Regulations, and can be found on the Internet at http://deq.state.wy.us/aqd/standards.asp. The PRB did not experience any exceedances of these PM_{10} standards through 2000, but recorded an average of five per year from 2001 through 2007; additional details regarding exceedances at the Buckskin Mine are provided in section 3.4. Although many of the previous exceedances were attributed to high winds, concerns about future potential exceedances of the National Ambient Air Quality Standards (NAAQS) may make it more difficult for a company planning to open a new mine to demonstrate that those operations would not result in additional air pollution levels that are above annual Wyoming standards.

If a lease sale is held and the successful bidder is not the original applicant, the new operator would be required to submit a new permit application, including detailed mining, monitoring, mitigation, and reclamation plans (versus a simple amendment of current plans) to the WDEQ for review. The new operator would also be required to submit a Resource Recovery and Protection Plan to the BLM for review. Before a new mining operation could begin, this plan must be approved by the BLM, a mining permit must be approved by the WDEQ, and a Mineral Leasing Act mining plan must be approved by the Assistant Secretary of the Interior.

In view of these issues, the current economies of mining in the Powder River Federal Coal Region appear to make construction of a new mine economically unfeasible using coal reserves in the proposed tract or BLM study area. Therefore, this alternative is not analyzed further in this EIS.

2.3.2 Alternative 4

Under Alternative 4, the BLM would delay the sale of federal coal reserves in the proposed tract and BLM study area. Under this alternative, it is assumed that a tract could be developed later as either a maintenance tract for an existing mine or a new mine start, depending on how long the sale was delayed. Alternative 4 was not analyzed in detail because it would not produce substantially different impacts from other alternatives that were analyzed in more detail. The environmental impacts of mining the coal later as part of an existing mine would be expected to be similar in nature and essentially equal in magnitude to the action alternatives discussed previously (section 2.2.1 and section 2.2.3). As discussed in section 2.3.1, the environmental

impacts from a new mine start would be expected to be greater than if the coal reserves were mined as an extension of an existing mine.

Delaying the lease sale would not guarantee that the BLM would receive a higher price during the initial bidding process, or a higher bonus bid or royalties and taxes once the lease is issued due to other reasons that may or may not be related to the quality and/or location of the coal reserves themselves. The price of coal and, thus, the rate of mining, is affected by various factors including, but not limited to, customer demand (sales) and transportation options. For example, coal prices were depressed in the early 2000s, which resulted in lower bid prices during that period. In other years, shipping constraints, combined with increased world energy demand and numerous natural disasters in other parts of the country, led to unusually large increases in coal prices.

The prices received for coal from the PRB have generally been increasing in recent years. If that trend continues, the fair market value of federal coal reserves could increase and a delayed sale would result in a higher lease bid, as well as higher bonus bid and royalty payments to the government when the lease is issued and coal is mined, respectively. This approach also would allow CBNG resources to be more completely recovered prior to mining. Likewise, if the fair market value of the coal reserves were to decrease, a delayed sale would bring lower initial and bonus bids as well as lower royalty, tax, and annual rental payments.

Royalty and tax payments are the largest revenue sources from new leases, but cannot be collected until the coal is permitted and mined; this process requires several years after the lease is issued. Therefore, the price of coal when it is mined (and essentially sold to the customer) affects royalty and tax payments. Higher coal prices result in greater royalty and tax payments, regardless of whether coal lessees have short- or long-term contracts with their customers. The reverse is true when coal prices decrease.

Other considerations include the value of making low-sulfur coal available now versus leaving mineable coal in place for future development, in anticipation of cleaner fuel sources being developed in the future. Continued leasing of low-sulfur coal from the PRB enables existing coal-fired power plants to more easily meet current CAA requirements until new technologies are developed to improve efficiency and reduce emissions. This approach provides a stable supply of power to meet increasing demand without a potentially significant increase in power costs for individuals and businesses, and meets current energy requirements while the new technologies are developed. If cleaner fuel sources are developed in the future, they could be phased in with less economic impact on the public. An economic analysis could be conducted to estimate the range of potential future economic benefits that would result from delaying the lease sale until coal prices rise. However, because it is impossible to predict with any certainty when or if those rates would increase, any projected benefits from delaying the lease sale would be speculation.

CBNG resources are currently being recovered from leases in and near the proposed tract and BLM study area. As of May 2008, 30 wells had been completed in the BLM study area and immediate vicinity (appendix E). Of those, 15 wells are currently producing and 3 have been shut in and may be re-instated for production in the future. Twelve other wells are no longer

producing, have been permanently abandoned, or have expired permits (Wyoming Oil and Gas Conservation Commission 2009). Additional information relative to conventional oil and gas and CBNG development in the proposed tract and immediately adjacent area is provided in section 3.3.2.

Several existing mechanisms can facilitate the continued recovery of these oil and gas resources prior to mining if the federal coal in the proposed tract or an alternative tract configuration is leased under the current timeline, as described below.

- The BLM can attach a Multiple Mineral Development stipulation to the lease. Such a stipulation would state that the BLM has the authority to withhold approval of coal mining operations that would interfere with the development of mineral leases issued prior to the coal lease.
- Mining the proposed tract or alternative tract configuration cannot occur until the coal lessee has a permit to mine the tract as approved by the WDEQ and a Mineral Leasing Act mining plan approved by the Secretary of the Interior. Before that mining plan can be approved, the BLM must approve the Resource Recovery and Protection Plan for mining the tract. Prior to approving the plan, the BLM can review the status of CBNG development in the final tract configuration and the mining sequence proposed by the coal lessee. The WDEQ permit approval process generally takes several years to complete. This interval would allow additional time for CBNG resources to be recovered from the leased tract.
- The BLM has a policy in place regarding conflicts between CBNG and coal recovery. This policy directs the BLM decision makers to optimize the recovery of both resources and to ensure that the public receives a reasonable return (BLM 2006a).

As described previously, rental and royalty provisions from the proposed tract or an alternative tract configuration would benefit the United States, if coal prices increased by the time mining began. Given the mechanisms currently in place, a large portion of the economically recoverable CBNG resources in the area would be expected to be recovered after a lease is issued and before mining occurred. The environmental impacts of mining the coal later as part of an existing mine would be expected to be similar in nature and essentially equal in magnitude to the action alternatives discussed in section 2.2.1 and section 2.2.3. If a new mine is required to mine the coal, the environmental impacts would be expected to be greater than if each tract were mined as an extension of an existing mine.

2.4 Regulatory Compliance, Mitigation, and Monitoring

In general, the levels of mitigation and monitoring required for surface coal mining by the SMCRA and Wyoming state law are more rigorous and extensive than those required for other surface disturbing activities. Those regulations and laws require surface coal mines to collect a wide range of detailed baseline information prior to mining, and implement extensive reclamation and/or mitigation measures and monitoring programs during and after mining. The

currently approved permit to conduct mining operations for the Buckskin Mine (i.e., the No Action Alternative) includes these requirements.

Required mitigation and monitoring programs are also considered to be part of the action alternatives considered in this EIS. These data collection requirements, monitoring commitments, and mitigation plans would be amended to include mining operations in the proposed tract or alternative tract configuration if they are leased and permitted for mining. The major mitigation and monitoring measures that are required by state or federal regulation are summarized in table 2-4. Specific information about some of these measures (including their results at the Buckskin Mine) is included in chapter 3. If impacts are identified during the leasing process that are not addressed by existing required mitigation measures, the BLM can require additional measures in the form of stipulations on the new lease within the limits of its regulatory authority. The mining and reclamation plan would also have to be revised to address any new concerns that are not included under existing procedures; that revised plan would have to be approved for the final tract configuration before any mining operations could be conducted, regardless of who acquires the tract.

Table 2-4. Regulatory Compliance, Mitigation, and Monitoring Measures for Surface Coal Mining Operations Legally Required for All Alternatives

Resource	Regulatory Compliance or Mitigation Required by Stipulations, State, or Federal Law[a]	Monitoring[a]
Topography and Physiography	▪ Reclaim to approximate original contour or other approved topographic configuration	▪ WDEQ checks as-built vs. approved topography with each annual report
Geology and Minerals	▪ Identify and selectively place or mix chemically or physically unsuitable overburden materials to minimize adverse effects on vegetation or groundwater	▪ WDEQ requires monitoring in advance of mining to detect unsuitable overburden
Soil	▪ Salvage soil suitable to support plant growth for use in reclamation ▪ Protect soil stockpiles from disturbance and erosional influences ▪ Selectively place at least 4 feet of suitable overburden on the graded backfill surface below replaced topsoil to meet guidelines for vegetation root zones	▪ Monitoring vegetation growth in reclaimed areas to determine need for soil amendments ▪ Sampling regraded overburden for compliance with root zone criteria
Air Quality	▪ Conduct dispersion modeling of mining plans for annual average particulate pollution impacts on ambient air ▪ Implement particulate pollution control technologies ▪ Implement work practices designed to minimize fugitive particulate emissions ▪ Use EPA or state-mandated best available control technology, including: – Fabric filtration or wet scrubbing of coal storage silo and conveyor vents – Watering or using chemical dust suppression on haul roads and exposed soils – Containing truck dumps and primary crushers – Covering conveyors	▪ On-site air quality monitoring for PM_{10} and/or TSP ▪ Off-site ambient monitoring for PM_{10} and/or TSP ▪ On-site compliance inspections

Table 2-4. Continued

Resource	Regulatory Compliance or Mitigation Required by Stipulations, State, or Federal Law[a]	Monitoring[a]
	– Promptly revegetating exposed soils – High-efficiency baghouse dust collection systems or passive enclosure control systems or atomizers/foggers on the crusher, conveyor transfer, storage bin and train loadout, meeting a standard of 0.01 grains per dry standard cubic foot of exit volume – Watering active work areas – Reclamation planning to minimize surface disturbances subject to wind erosion – Paving access roads – Haul truck speed limits – Limited material drop heights for shovels and draglines	▪
	▪ Follow voluntary and required measures to avoid exposing the public to NO_2 from blasting clouds, including: – Phoning neighbors and workers to notify them prior to blasting – Monitoring weather and atmospheric conditions prior to decisions to blast – Timing blasts to avoid temperature inversions and to minimize inconvenience to neighbors – Closing public roads when appropriate to protect the public – Minimizing blast sizes – Posting signs on major public roads	▪
Surface Water	▪ Build and maintain sediment-control ponds or other devices during mining ▪ Reclaim drainages to approximate premining drainage patterns ▪ Reclaim stockponds and playas to approximate premine characteristics	▪ Monitoring storage capacity in sediment ponds ▪ Monitoring quality of discharges ▪ Monitoring streamflow and water quality
Groundwater Quantity	▪ Evaluate cumulative impacts on water quantity associated with proposed mining ▪ Replace existing water rights that are interrupted, discontinued, or diminished by mining with water of equivalent quantity	▪ Monitoring wells ▪ track water levels in overburden, coal, interburden, underburden, and backfill
Groundwater Quality	▪ Evaluate cumulative impacts on water quality associated with proposed mining ▪ Replace existing water rights that are interrupted, discontinued, or diminished by mining with water of equivalent quality	▪ Monitoring wells ▪ track water quality in overburden, coal, interburden, underburden, and backfill
Alluvial Valley Floors	▪ Identify all AVFs that would be affected by mining ▪ Comply with WDEQ determination of significance to agriculture of all identified AVFs affected by mining ▪ Protect downstream AVFs during mining ▪ Restore essential hydrologic function of all AVFs affected by mining	▪ Monitoring to determine restoration of essential hydrologic functions of any declared AVF
Wetlands	▪ Identify all wetlands that would be affected by mining ▪ Comply with U.S. Army Corps of Engineers identification of jurisdictional wetlands ▪ Replace all jurisdictional wetlands that would be disturbed by mining ▪ Replace functional wetlands as required by surface managing agency, surface landowner, or WDEQ	▪ Monitoring reclaimed wetlands using same procedures used to identify premining jurisdictional wetlands

Table 2-4. Continued

Resource	Regulatory Compliance or Mitigation Required by Stipulations, State, or Federal Law[a]	Monitoring[a]
Vegetation	▪ Revegetate reclaimed areas according to a comprehensive revegetation plan using approved permanent reclamation seed mixtures consisting predominantly of species native to the area ▪ Reclaim 20% of disturbed area with native shrubs at a density of one per square meter ▪ Control erosion on reclaimed lands prior to seeding with final seed mixture using mulching, cover crops, or other approved measures ▪ Chemically and mechanically control weed infestation ▪ Use direct hauling for topsoil ▪ Selectively plant shrubs in riparian areas ▪ Plant sagebrush ▪ Create depressions and rock piles ▪ Use special planting procedures around rock piles ▪ Post reclamation bond covering the cost of reclamation	▪ Monitoring revegetation growth and diversity until release of final reclamation bond (minimum 10 years) ▪ Monitoring erosion to determine need for corrective action during establishment of vegetation ▪ Use of controlled grazing during revegetation evaluation to determine suitability for postmining land uses
Wildlife and Sensitive Species	▪ Reclaim to approximate premine topography to the maximum extent possible ▪ Plant a diverse mixture of grasses, forbs, and shrubs in configurations beneficial to wildlife ▪ Design fences to permit wildlife passage ▪ Raptor-proof power transmission poles per current APLIC recommendations ▪ Use raptor-safe power lines per current APLIC recommendations ▪ Create artificial raptor nest sites ▪ Increase habitat diversity by creating rock clusters and shallow depressions on reclaimed land ▪ Plant cottonwoods along reclaimed drainages ▪ Reclaim drainages, wetlands, and AVFs disturbed by mining ▪ Reduce vehicle speed limits to minimize mortality ▪ Instruct employees not to harass or disturb wildlife ▪ Follow USFWS approved avian monitoring and mitigation plans ▪ Avoid disturbance near bald eagle winter roost sites ▪ Reclaim bald eagle perching and foraging areas disturbed by mining ▪ Reclaim sage-grouse and mountain plover habitat disturbed by mining ▪ Survey for sage-grouse, mountain plovers, and black-tailed prairie dogs	▪ Baseline and annual wildlife monitoring surveys ▪ Monitoring for Migratory Bird Species of Management Concern in Wyoming
Threatened, Endangered, Proposed, and Candidate Species	▪ Survey for Ute ladies'-tresses and blowout penstemon ▪ Comply with USFWS block clearance from black-footed ferret surveys in project area ▪ Same as Wildlife and Sensitive Species above	▪ Baseline and annual wildlife monitoring surveys
Land Use	▪ Reclaim mined areas for historic uses (grazing and wildlife)	▪ Monitoring of controlled grazing prior to bond release evaluation
Cultural Resources	▪ Conduct predisturbance Class I and III surveys to identify cultural properties on all state and federal lands, and on private lands affected by federal undertakings ▪ Consult with SHPO to evaluate eligibility of cultural properties for the NRHP ▪ Avoid or recover data from significant cultural properties identified by surveys, according to an approved plan ▪ Notify appropriate agency personnel if historic or prehistoric materials are uncovered during mining operations ▪ Instruct employees of the importance of and regulatory obligations to protect cultural resources	▪ Monitoring mining activities during topsoil stripping ▪ Ceasing activities and notifying authorities if unidentified sites are encountered during topsoil removal

Table 2-4. Continued

Resource	Regulatory Compliance or Mitigation Required by Stipulations, State, or Federal Law[a]	Monitoring[a]
Native American Concerns	▪ Notify Native American tribes with known interest in this area of leasing action and requesting help in identifying potentially significant religious or cultural sites	▪ No specific monitoring program
Paleontological Resources	▪ Conduct predisturbance surveys to identify paleontological resources on all state and federal lands, and on private lands affected by federal undertakings ▪ Notify appropriate agency personnel if potentially significant paleontological sites are discovered during mining ▪ Instruct employees of the importance of and regulatory obligations to protect paleontological resources	▪ Ceasing activities and notifying authorities if unidentified resources are encountered during topsoil removal
Visual Resources	▪ Reclaim postmining landscapes to approximate original contours and replanting with native species	▪ No specific monitoring program; land contours and plant communities monitored as part of topography and vegetation requirements, respectively
Noise	▪ Protect employees from hearing loss	▪ Mine Safety and Health Administration inspections
Transportation Facilities	▪ Relocate existing pipelines, if necessary, in accordance with specific agreement between pipeline owner and coal lessee	▪ Monitoring conducted by pipeline company per WDEQ requirements
Socioeconomics	▪ Pay royalty and taxes as required by federal, state, and local regulations. No mitigation measures are proposed	▪ Surveying and reporting to document volume of coal removed
Hazardous and Solid Waste	▪ Dispose of solid waste and sewage according to approved plans ▪ Store and recycle waste oil ▪ Maintain files containing Material Safety Data Sheets for all chemicals, compounds, and/or substances used during course of mining ▪ Ensure that all production, use, storage, transport, and disposal of hazardous materials are in accordance with applicable existing or hereafter promulgated federal, state, and government requirements ▪ Comply with emergency reporting requirements for releases of hazardous materials as established under the Comprehensive Environmental Response, Compensation, and Liability Act, as amended ▪ Prepare and implement spill prevention control and countermeasure plans, spill response plans, inventories of hazardous chemical categories pursuant to section 312 of Superfund Amendments and Reauthorization Act, as amended ▪ Prepare emergency response plans.	▪ No specific monitoring other than required by these other regulations and response plans

WDEQ = Wyoming Department of Environmental Quality; PM_{10} = particulate matter of 10 micrometers or less in diameter; TSP = total suspended particulates; EPA = Environmental Protection Agency; NO_2 = nitrogen dioxide; AVF = alluvial valley floors; USFWS = U.S. Fish and Wildlife Service; SHPO = State Historic Preservation Office; NRHP = National Register of Historic Places.

[a] These requirements, reclamation and mitigation plans, and monitoring plans are required by the Surface Mining Control and Reclamation Act and Wyoming state law. They are already in place for the existing Buckskin Mine in its current approved WDEQ mining and reclamation plan (the No Action Alternative). Under the Proposed Action and Alternative 2, these requirements, reclamation and mitigation plans, and monitoring plans would be addressed in a mining plan revision for the additional leased tract; they would be approved by appropriate state and federal agencies before mining could occur.

Source: WDEQ Rules and Regulations.

If impacts are identified during the leasing process that are not addressed by existing required mitigation measures, the BLM can require additional mitigation measures (stipulations) for the new lease within the limits of its regulatory authority. In general, the levels of mitigation and monitoring required by SMCRA and Wyoming state law for surface coal mining are more extensive than those required for other surface-disturbing activities; however, concerns are periodically identified that are not addressed under existing procedures.

2.5 Summary of Coal Production and Disturbance under the Proposed Action and Alternatives

The decision-making process for public lands and/or federal minerals in Wyoming is conducted in compliance with NEPA, which requires all federal agencies to:

- involve the interested public in their decision-making process;
- consider reasonable alternatives to the proposed actions;
- develop measures to mitigate environmental impacts; and
- prepare environmental documents that disclose the impacts of the proposed actions and alternatives.

Table 2-5 compares coal reserves, lease and permit areas, production, mine life, and revenues for the Buckskin Mine and under existing conditions and under the Proposed Action and alternatives analyzed in this EIS. These figures were based on an average production rate of 25 million tons per year, which is the current projected life-of-mine rate.

Detailed discussions of the direct and indirect environmental impacts under the Proposed Action and analyzed alternatives are provided in chapter 3; a summary of those impacts is provided in table 3.0-2. Cumulative environmental impacts, based on upper and lower estimates for future coal production in the region, are discussed in chapter 4, and a summary of those impacts is provided in table 4-41. The Proposed Action and alternatives for the Hay Creek II EIS fall within those projections. As described in section 2.3, Alternatives 3 and 4 were considered in the initial phase of this EIS, but were eliminated from further analysis because they were not feasible or were not substantially different from other analyzed alternatives, respectively.

Table 2-5. Comparison of Coal Reserves, Lease and Permit Areas, Production, Mine Life, and Revenues by Alternative

Item	Existing Buckskin Mine Permit Area	Additional Under		
		Alternative 1 (No Action)	Proposed Action	Alternative 2
In-Place Coal (as of 12-31-08)	460.9 mmt	0	77.2 mmt[a] 269.	7 mmt[b]
Accessible Mineable Coal (as of 12-31-08)[c]	361.9 mmt	0	60.1 mmt[a] 166.	3 mmt[b]
Recoverable Coal (as of 12-31-08)[d]	344.3 mmt	0	54.1 mmt[a] 149.	7 mmt[b]
% Increase in Estimated Recoverable Coal (as of 12/31/08)[d]	— 0		15.7%	43.5%
Coal Lease Area	6,438.2 acres[e]	0	419.0 acres	1,883.1 acres
Permit Area (as of 12/31/08)	8,011.5 acres	0	478.0 acres	2,191.6 acres
Average Annual Post-2008 Coal Production	25 mmt	0	0	0
Remaining Life of Mine (Post-2008)	14 years	0	2 years	up to 6 years
Average Number of Employees	350	0	0	0
Total Projected State and Local Revenues (Post-2008)[f]	$563.6million 0		$90.6–$108.8 million	$250.2–$300.4 million
Total Projected Federal Revenues (Post-2008)[g]	$417.0 million	0	$69.2–$87.3 million	$191.0–$241.1 million

mmt = million tons

[a] Based on the entire proposed tract, including its overlap with the existing Buckskin Mine permit area.

[b] Based on the entire BLM study area, including its overlap with the existing Buckskin Mine permit area.

[c] Maximum estimate; does not include coal reserves that are inaccessible due to criteria 3 (i.e., reserves beneath the occupied residence and associated 300-foot buffer zone; or the public road rights-of-way [Collins and McGee roads], their associated 100-foot buffer zones, and other operationally limited lands between the two roads).

[d] Assumes a recovery rate of 95% for coal in the Canyon seam and a 90% for all other coal reserves; does not include coal left behind as support pillars and similar structures, or unavoidably lost through spillage and spontaneous natural fires during normal mining operations..

[e] Includes federal and state coal leases currently held by the Buckskin Mining Company.

[f] Revenues to the State of Wyoming and local governments include severance taxes; property and production taxes (ad valorem); sales and use taxes; and Wyoming's share of federal royalty payments, bonus bids, annual rental payments, and Abandoned Mine Land fees. State revenues are based on an assumed price of $7.85 per ton of "recoverable coal," federal royalty of 12.5% of the value less 51% federal share, plus $0.315 per ton for Abandoned Mine Land fees on assumed 25% state share, plus bonus payments of between $0.30 and $0.97 per ton of LBA leased coal per ton (based on average of six LBAs in 2004 and 2005) times the tonnage of recoverable coal times a 50% state share, plus $0.07 per ton estimated sales and use taxes, plus $0.33 per ton estimate for ad valorem taxes, plus $0.415 per ton in severance taxes. Only the sales and use taxes paid directly by the mine are considered (i.e., taxes generated by vendors and suppliers and by consumer expenditure supported directly and indirectly by the mine are not included. These figures could change based on the outcome of recent legislation that changed the percentage of distribution to states.

[g] Federal revenues are based on an assumed price of $7.85 per ton, federal royalty of 12.5% times 51% share, plus $0.315 per ton for Abandoned Mine Land fees times an assumed 75% federal share, plus black lung tax of $0.00261 per ton, plus bonus payments of between $0.30 and $0.97 per ton of LBA leased coal (based on the range of the six LBA sales in 2004 and 2005) times tonnage of recoverable coal minus a 50% federal share. These figures could change based on the outcome of recent legislation that changed the percentage of distribution to states.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the affected environment (existing conditions) and analyzes the environmental consequences (potential direct and indirect impacts) on various resources resulting from the Proposed Action and alternatives.

In keeping with the purpose of an EIS[1], the analyses presented in this document are based primarily on existing information. The general analysis area is substantially similar to the adjacent existing Buckskin Mine permit area in its physical features and resources. Detailed site-specific environmental data were collected and impact analyses prepared to secure the existing coal leases and necessary mining permits for the mine. The analysis area for many of these previous efforts encompassed most, if not all, of the general analysis area. Therefore, these previous surveys and impact analyses are relevant to the general analysis area in most cases.

Impact Determinations

Impacts were identified in this EIS based on criteria set forth by the Council on Environmental Quality (40 CFR 1508.27), BLM NEPA Handbook H-1790-1, and the professional judgment of the specialists completing the analyses. Impacts can be beneficial or adverse, and can be a primary result (direct) of an action, a secondary result (indirect), or cumulative; cumulative impacts are discussed in chapter 4. They can be short-term (operational, persisting during active mining and reclamation); long-term (persisting through the time the reclamation bond is released—minimum of 10 years beyond active reclamation), or permanent. Impacts also vary in terms of significance. Significance can range from no impact or negligible impacts to substantial or significant impacts. Impacts can also be substantial during mining but reduced to no impact or negligible following completion of reclamation. In this EIS, impacts are considered to be adverse unless specifically identified as beneficial.

Resources Analyzed in this EIS

Resources addressed in this chapter were identified during the scoping process or by an interdisciplinary team review as having the potential to be affected. The BLM requires that certain elements are analyzed when present in the affected environment. The following required elements are present in the general analysis area and are addressed in this EIS:

- air quality (section 3.4);
- water quality (section 3.5);
- wetlands/riparian zones (section 3.7);
- invasive nonnative species (section 3.9);
- threatened and endangered species (sections 3.9 and 3.10);

[1] Refer to page xx for a list of abbreviations and acronyms used in this document.

- cultural resources (section 3.12);
- hazardous or solid wastes (section 3.16);
- Native American religious concerns (section 3.17); and
- environmental justice (section 3.17).

The following additional resources also are present in the general analysis area and are addressed in this EIS:

- topography and physiography (section 3.2);
- geology, mineral, and paleontological resources (section 3.3);
- other water resources (section 3.5);
- alluvial valley floors (section 3.6);
- soils (section 3.8);
- vegetation (section 3.9);
- wildlife (section 3.10);
- land use and recreation (section 3.11);
- visual resources (section 3.13);
- noise (section 3.14);
- transportation resources (section 3.15); and
- socioeconomics (section 3.17).

Five additional aspects considered in this chapter are:

- regulatory compliance;
- mitigation and monitoring;
- residual impacts;
- the relationship between local short-term uses of the human environment and the maintenance and enhancement of long-term productivity (section 3.18); and
- any irreversible and irretrievable commitments of resources that would be associated with the action alternatives (section 3.19) (42 United States Code § 4332[C]).

The following elements, which are required by the BLM when present in the affected environment, are not present in the general analysis area and are, therefore, not addressed in this EIS:

- areas of critical environmental concern;
- prime or unique farmlands;
- floodplains;

- wild and scenic rivers; and
- wilderness.

> Individual data reports were prepared for each resource; those reports include the information used to prepare the EIS. Copies of those reports can be viewed at the BLM Wyoming High Plains District Office in Casper, Wyoming.

As discussed in chapter 2, regulatory compliance, mitigation, and monitoring required by federal and/or state law are considered to be part of the action alternatives and are described for each resource area.

Summary of Disturbance Areas and Impacts

The general analysis area represents the maximum surface area that could be disturbed by mining activities analyzed in this EIS; it encompasses approximately 2,847.3 acres (map 3.0-1). The areas where mining and mine-related activities would occur under each alternative are provided below.

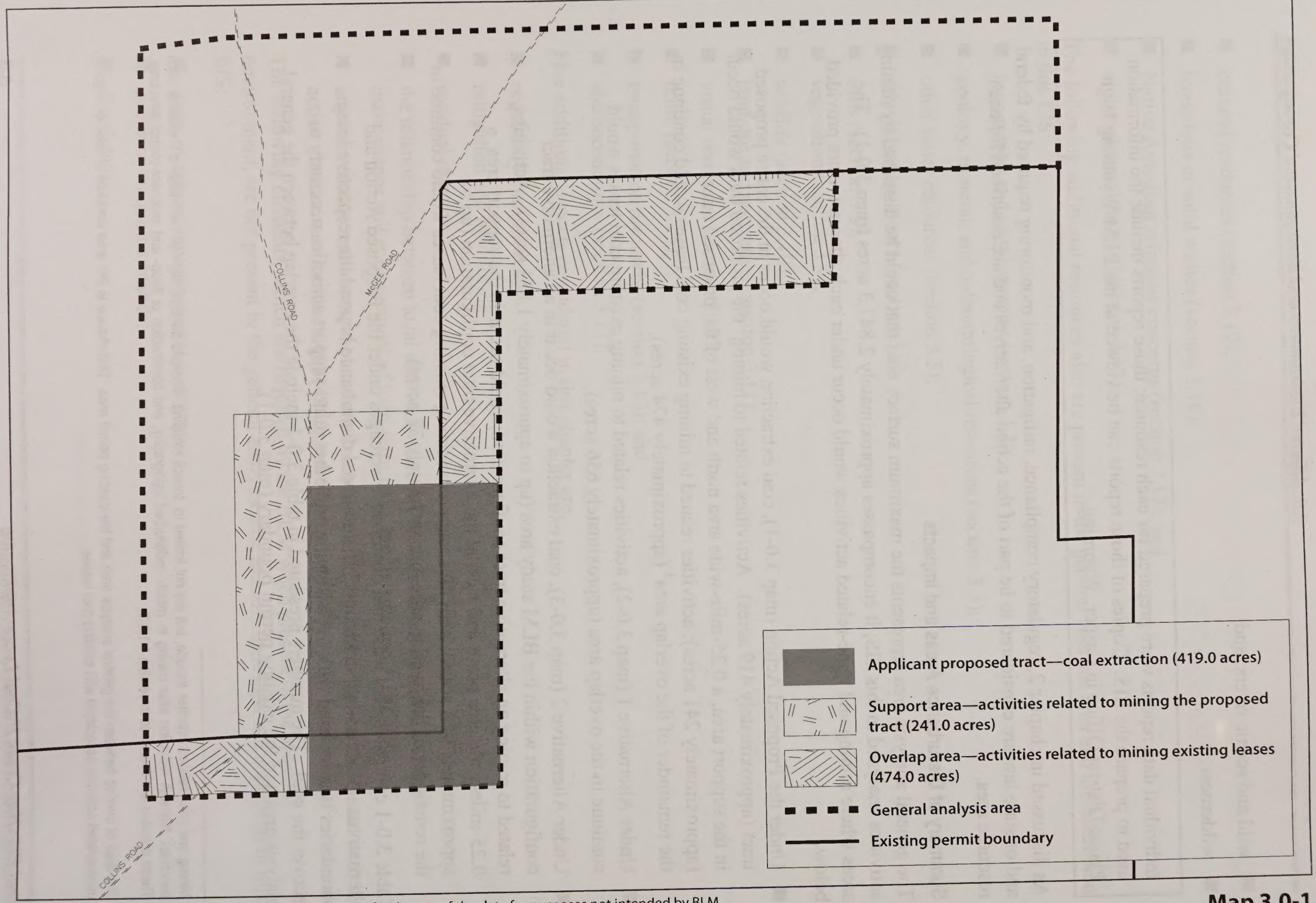
- Under the Proposed Action (map 3.0-1), coal extraction would occur in the entire proposed tract (approximately 419 acres). Activities related to mining[2] the proposed tract would occur in the support area, a 0.25-mile-wide area north and west of the proposed tract (approximately 241 acres); activities related to mining existing coal leases would continue in the remainder of the overlap area[3] (approximately 474 acres).
- Under Alternative 1 (map 3.0-2), activities related to mining existing coal leases would continue in the overlap area (approximately 656 acres).
- Under Alternative 2 (map 3.0-3), coal extraction would occur in an alternative tract configuration within the BLM study area (up to approximately 1,883 acres). Activities related to mining an alternative tract configuration would occur in the support area, a 0.25-mile-wide area north and west of the alternative tract configuration (up to approximately 926 acres); activities related to mining existing coal leases would continue in the remainder of the overlap area (approximately 38 acres).

Table 3.0-1 compares coal lease and disturbance acreages under the Proposed Action and alternatives. As described in section 3.0, additional disturbance beyond the respective lease boundaries is associated with overstripping and other mine-support activities necessary to recover the coal. The numbers presented in table 3.0-1 include the overlap between the general analysis area and the existing permit boundary (map 3.0-1).

---

[2] Mining and mine-related activities include, but are not limited to, topsoil stripping, stockpile storage, highwall back-sloping (including catch benches), highwall reduction after mining to match undisturbed topography, and construction of flood- and sediment-control structures. These activities are described in section 1.1.3.3.

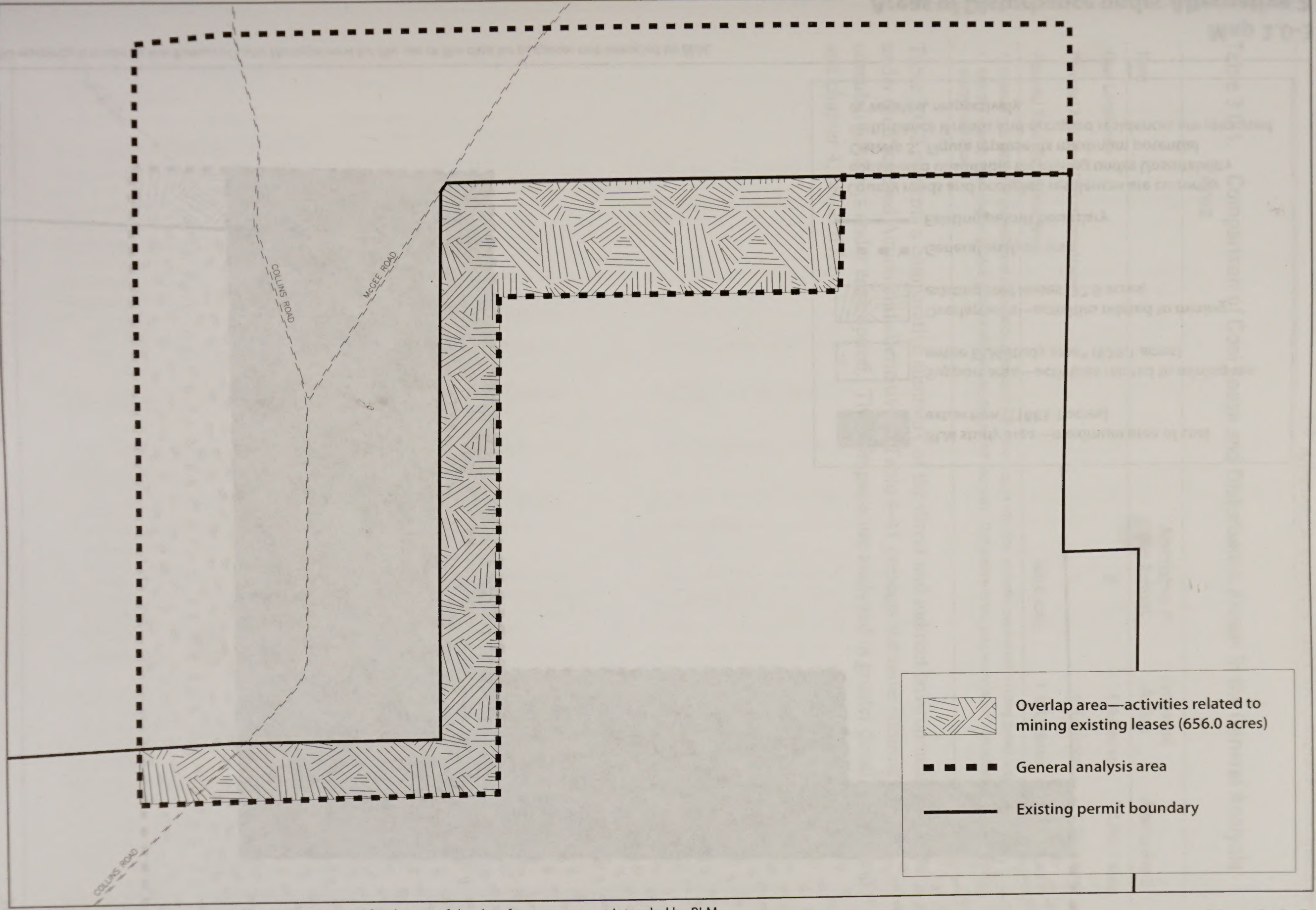
[3] The area of overlap between the general analysis area and the existing permit area. Disturbance in this area would be a result of ongoing mine-related activities associated with existing coal leases.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 3.0-1

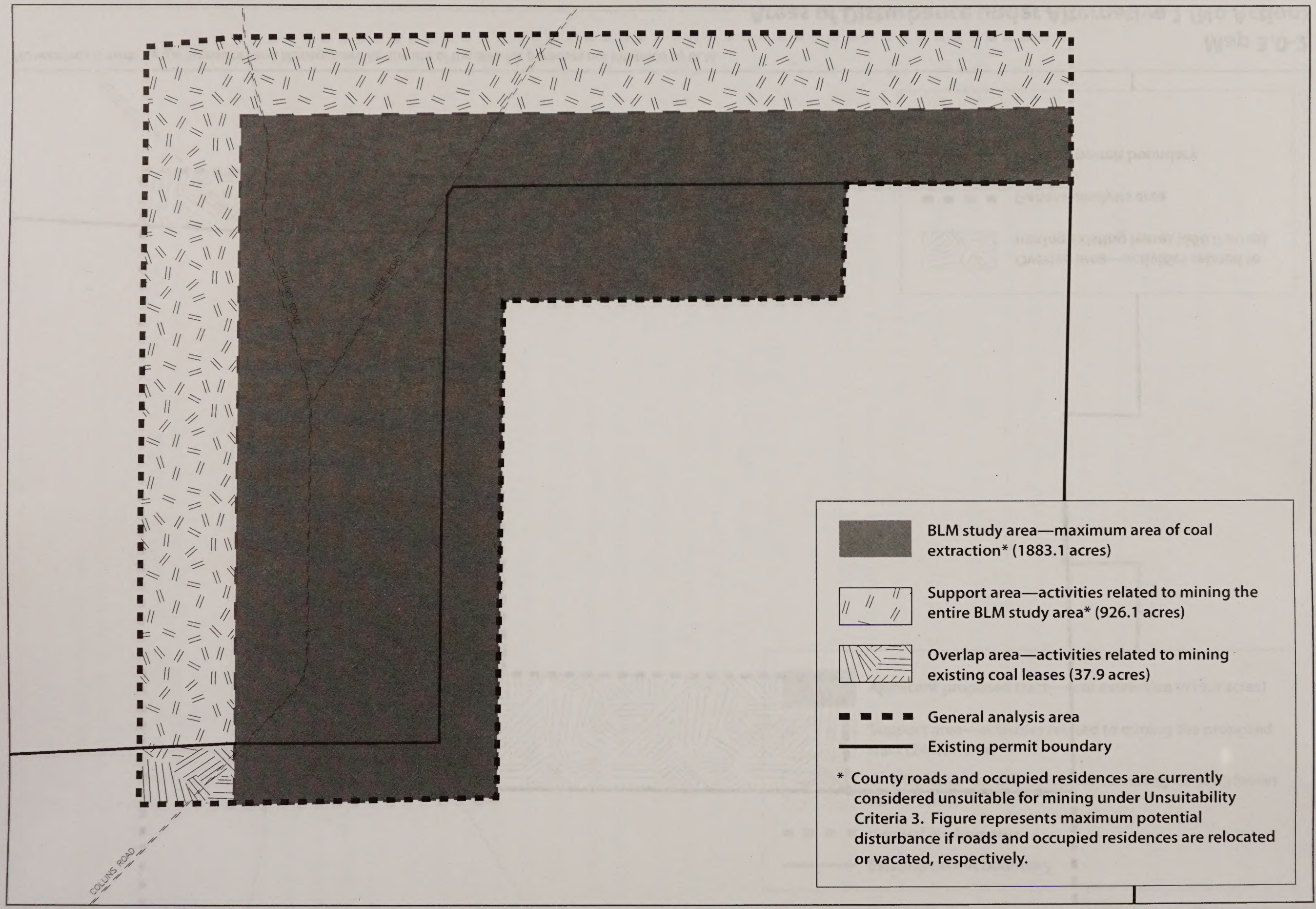
Areas of Disturbance under the Proposed Action



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 3.0-2

Areas of Disturbance under Alternative 1 (No Action)



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 3.0-3
Areas of Disturbance under Alternative 2

Table 3.0-1. Comparison of Coal Lease and Disturbance Areas[a] in the General Analysis Area

Item	Alternative 1[b] (No Action)	Proposed Action	Alternative 2
Coal Lease Area	0	419.0 acres	1,883.1 acres
Potential Additional Disturbance Area[a]	0	478.0 acres	2,191.6 acres
Potential Total Disturbance Area[b]	656.0 acres	1,134.0 acres	2,847.3 acres

[a] Includes coal extraction and additional disturbance associated with mine-support activities; excludes overlap with existing permit area.

[b] Includes overlap area between general analysis area and existing permit boundary. Disturbance in this area would result from activities related to mining existing coal leases.

Table 3.0-2 presents a comparative summary of the direct and indirect environmental impacts under the Proposed Action and alternatives. Table 4-41 presents the same summary for the cumulative effects under each option. These impacts are analyzed in greater detail in chapter 3 and chapter 4, respectively.

Table 3.0-2. Summary Comparison of Magnitude and Duration of Direct and Indirect Impacts in the General Analysis Area under the Proposed Action and Alternatives

Description of Potential Impact by Resource	Magnitude[a] and Duration[b] of Impact[c]		
	No Action Alternative[d]	Action Alternatives[e]	
	Alternative 1	Proposed Action[f]	Alternative 2[g]
3.2 TOPOGRAPHY AND PHYSIOGRAPHY			
Lower surface elevation	No impact	Moderate, permanent on 419 acres	Moderate, permanent on up to 1,883 acres
Permanent topographic moderation, which could result in:			
▪ Microhabitat reduction	Minor to moderate, long-term on 656 acres	Minor to moderate, long-term on 1,134 acres; no impact on rough breaks	Minor to moderate, long-term on up to 2,847 acres
▪ Habitat diversity reduction	Minor to moderate, long-term on 656 acres	Minor to moderate, long-term on 1,134 acres	Minor to moderate, long-term on up to 2,847 acres
▪ Big game carrying capacity reduction	Minor, long-term on 656 acres	Minor, long-term on 1,134 acres	Minor, long-term on up to 2,847 acres
▪ Reduction in water runoff and peak flows	Moderate, beneficial, long-term on 656 acres	Moderate, beneficial, long-term on 1,134 acres	Moderate, beneficial, long-term on up to 2,847 acres
▪ Increased precipitation infiltration	Moderate, beneficial, long-term on 656 acres	Moderate, beneficial, long-term on 1,134 acres	Moderate, beneficial, long-term on up to 2,847 acres
▪ Reduction in erosion	Moderate, beneficial, long-term on 656 acres	Moderate, beneficial, long-term on 1,134 acres	Moderate, beneficial, long-term on up to 2,847 acres
▪ Potential enhanced vegetative productivity	Moderate, beneficial, long-term on 656 acres	Moderate, beneficial, long-term on 1,134 acres	Moderate, beneficial, long-term on up to 2,847 acres
▪ Potential acceleration of groundwater recharge	Moderate, beneficial, long-term on 656 acres	Moderate, beneficial, long-term on 1,134 acres	Moderate, beneficial, long-term on up to 2,847 acres
3.3 GEOLOGY, MINERAL RESOURCES, AND PALEONTOLOGY			
Removal of coal	No impact	Significant, permanent on 419 acres	Significant, permanent on up to 1,883 acres
Removal and replacement of topsoil and overburden	No impact	Significant, permanent on 419 acres	Significant, permanent on up to 1,883 acres
Physical characteristic alterations in replaced overburden	No impact	Significant, permanent on 419 acres	Significant, permanent on up to 1,883 acres

Table 3.0-2. Continued

Description of Potential Impact by Resource	Magnitude[a] and Duration[b] of Impact[c]		
	No Action Alternative[d]	Action Alternatives[e]	
	Alternative 1	Proposed Action[f]	Alternative 2[g]
Loss of unrecovered CBNG through venting and/or depletion of hydrostatic pressure	No impact	Moderate to substantial, permanent on 419 acres	Moderate to substantial, permanent on up to 1,883 acres
Loss of access for development of subcoal conventional oil and gas resources and other minerals/loss of resources	Minor, short-term on access to 656 acres; minor, permanent on clinker resources; no impacts on uranium or bentonite resources	Moderate, short-term on access to 419 acres; minor, short-term on access to 715 surface acres; no impacts on clinker, uranium, or bentonite resources	Moderate, short-term on access to up to 1,883 acres; minor, short-term on access to up to 964 surface acres; minor, permanent on clinker resources; no impacts on uranium or bentonite resources
Destruction of paleontological resources that are not exposed on the surface	Moderate to substantial, permanent on 656 acres	Moderate to substantial, permanent on 1,134 acres	Moderate to substantial, permanent on up to 2,847 acres
3.4 Air Quality			
Particulate emissions:			
▪ Elevated concentrations associated with projected average production rate of 25 mmt per year in compliance with ambient standards	Moderate, short-term; no projected increase or exceedances	Moderate, short-term; no projected increase or exceedances in currently approved mining operations	Moderate, short-term; no projected increase or exceedances in currently approved mining operations
▪ Potential for public exposure to particulate emissions along U.S. Highway 14-16, various county roads, and occupied dwellings in the area	Minor, short-term for most residences; highway and county roads average 0.5 mile away; moderate for one occupied residence within 0.5 mile; moderate for one occupied residence within 0.25 mile	Minor, short-term for most residences; highway is ≥1 mile away; county road adjacent for 0.6 mile stretch; moderate for one occupied residence within 0.25 mile of overlap area	Minor to moderate, short-term; highway is ≥0.5 mile away; two county roads pass through area; moderate, short-term for one occupied residence within 0.25 mile; substantial, short-term for one occupied residence within general analysis area
▪ Potential for human health impacts as a result of exposure to particulate emissions	Minor, short-term; no projected increase or exceedances	Minor, short-term; no projected increase or exceedances in currently approved mining operations	Minor to moderate, short-term; no projected increase or exceedances in currently approved mining operations
NO_x emissions from machinery:			
▪ Elevated concentrations associated with average production of 25 mmt per year in compliance with ambient standards	Minor to moderate, short-term; no NO_x point sources at Buckskin; no projected increase or exceedances	Minor to moderate, short-term; no NO_x point sources at Buckskin; no projected increase or exceedances in currently approved mining operations	Minor to moderate, short-term; no NO_x point sources at Buckskin; no projected increase or exceedances in currently approved mining operations

Table 3.0-2. Continued

Description of Potential Impact by Resource	Magnitude[a] and Duration[b] of Impact[c]		
	No Action Alternative[d]	Action Alternatives[e]	
	Alternative 1	Proposed Action[f]	Alternative 2[g]
▪ Potential for public exposure along U.S. Highway 14-16, various county roads, and occupied dwellings in the area	Minor to substantial, short-term; no NO_x point sources at Buckskin; highway and county roads average 0.5 mile away; moderate, short-term for one occupied residence within 0.5 mile; substantial, short-term for one occupied residence within 0.25 mile	Minor to substantial, short-term; no NO_x point sources at Buckskin; no projected increase or exceedances in currently approved mining operations; highway is ≥1 mile away; county road adjacent for 0.6 mile stretch; moderate for one occupied residence within 0.25 mile of overlap	Minor to substantial, short-term; no NO_x point sources at Buckskin; no projected increase or exceedances in currently approved mining operations; highway is ≥0.5 mile away; two county roads pass through area; moderate for one occupied residence within 0.25 mile; substantial for one occupied residence within general analysis area
▪ Potential for human health impacts as a result of exposure	Minor, short-term; no NO_x point sources at Buckskin; no projected increase or exceedances	Minor, short-term; no NO_x point sources at Buckskin; no projected increase or exceedances in currently approved mining operations	Minor to moderate, short-term; no NO_x point sources at Buckskin; no projected increase or exceedances in currently approved mining operations
NO_x emissions from blasting (in compliance with Buckskin Mine permit blasting conditions):			
▪ Elevated concentrations associated with average production of 25 mmt per year in compliance with ambient standards	Minor, short-term	Minor, short-term; no projected increase or exceedances in currently approved mining operations	Minor, short-term; no projected increase or exceedances in currently approved mining operations
▪ Potential for public exposure along U.S. Highway 14-16, various county roads, and occupied dwellings in the area	Minor, short-term	Minor, short-term; no projected increase or exceedances in currently approved mining operations highway is ≥1 mile away; county road adjacent for 0.6 mile stretch; nearest occupied home > 0.5 mile away	Minor, short-term; no projected increase or exceedances in currently approved mining operations highway is ≥0.5 mile away; two county roads pass through area; minor for one occupied residence within 0.25 mile and one within general analysis area
▪ Potential for human health impacts as a result of exposure	Minor, short-term	Minor, short-term; no projected increase or exceedances in currently approved mining operations	Minor, short-term; no projected increase or exceedances in currently approved mining operations
Visibility:			
▪ Elevated concentrations of fine particulate matter associated with average production rate of 25 mmt per year	Minor, short-term; no projected increase or exceedances; no changes in current VRM class; no visual resources unique to area present	Minor, short-term; no projected increase or exceedances in currently approved mining operations; no projected changes in current VRM class; no visual resources unique to area present	Minor, short-term; no projected increase or exceedances in currently approved mining operations; no projected changes in current VRM class; no visual resources unique to area present

Table 3.0-2. Continued

Description of Potential Impact by Resource	Magnitude[a] and Duration[b] of Impact[c]		
	No Action Alternative[d]	Action Alternatives[e]	
	Alternative 1	Proposed Action[f]	Alternative 2[g]
Acidification of lakes:			
▪ NO_2 emissions from mining coal at Buckskin	Minor, short-term; no NO_2 point sources at Buckskin; no sensitive lakes in vicinity	Minor, short-term; no NO_2 point sources at Buckskin; no sensitive lakes in vicinity	Minor, short-term; no NO_2 point sources at Buckskin; no sensitive lakes in vicinity
▪ SO_2 emissions derived from burning Buckskin Mine coal to produce power	Moderate, short-term in vicinity of power plants; no sensitive lakes in vicinity	Moderate, short-term in vicinity of power plants; no sensitive lakes in vicinity	Moderate, short-term in vicinity of power plants; no sensitive lakes in vicinity
3.5 Water Resources			
Groundwater:			
▪ Removal of coal and overburden aquifers	No impact	Substantial, permanent on 419 acres	Substantial, permanent on up to 1,883 acres
▪ Replacement of existing coal and overburden with unconsolidated backfill material	No impact	Substantial, permanent on 419 acres	Substantial, permanent on up to 1,883 acres
▪ Depressed water levels in overburden and coal aquifers adjacent to mine	No impact	Moderate, short-term	Moderate, short-term
▪ Change in hydraulic properties in backfilled areas	No impact	Moderate, long-term	Moderate, long-term
▪ Increase in total dissolved solids concentrations in backfilled areas	No impact	Moderate, short-term	Moderate, short-term
▪ Use of subcoal aquifers for water supply	No impact	Negligible, short-term	Negligible, short-term
▪ Decrease in water supply for groundwater-right holders within the 5-foot drawdown area	No impact	Moderate, long-term	Moderate, long-term
Surface water:			
▪ Diversion and/or disruption of surface drainage systems	Substantial, short-term on 656 acres; no channel diversions	Substantial, short-term on 1,134 acres; no channel diversions	Substantial, short-term on up to 2,847 acres; no channel diversions expected
▪ Reconstruction of surface drainage systems	Permanent on 656 acres	Permanent on 1,134 acres	Permanent on up to 2,847 acres

Table 3.0-2. Continued

Description of Potential Impact by Resource	Magnitude[a] and Duration[b] of Impact[c]		
	No Action Alternative[d]	Action Alternatives[e]	
	Alternative 1	Proposed Action[f]	Alternative 2[g]
▪ Increased runoff and erosion rates on disturbed lands due to vegetation removal	Minor to moderate, short-term on 656 acres with implementation of flood- and erosion-control structures and reseeding	Minor to moderate, short-term on 1,134 acres with implementation of flood- and erosion-control structures and reseeding	Minor to moderate, short-term on up to 2,847 acres with implementation of flood- and erosion-control structures and reseeding
▪ Increased infiltration on reclaimed lands due to topographic moderation	Moderate, beneficial, long-term on 656 acres	Moderate, beneficial, long-term on 1,134 acres	Moderate, beneficial, long-term on up to 2,847 acres
▪ Increased runoff on reclaimed lands due to loss of soil structure	Moderate, long-term on 656 acres	Moderate, long-term on 1,134 acres	Moderate, long-term on up to 2,847 acres
▪ Potential for adverse downstream effects as a result of sediment produced by large storms	Minor to moderate, temporary due to existing diversion	Minor to moderate, temporary; no connected drainages	Minor to moderate, temporary; limited drainage systems
Water rights:			
▪ Disruption of water supply for water-rights holders with wells completed in the coal or overburden aquifer within the 5-foot drawdown area or with surface water rights within the disturbance area	No impact	Moderate, long-term (until recharge) for groundwater wells; minor long-term for one surface water right; no connected drainages; no new creek diversions	Moderate, long-term (until recharge) for groundwater wells; moderate, long-term for up to two surface water rights; no connected drainages; no new creek diversions
3.6 Alluvial Valley Floors			
Removal and restoration of AVFs	No impact; no AVFs	No impact; no AVFs	No impact; no AVFs
Disruptions to streamflows supplying downstream AVFs	No impact; no AVFs; stream diversions constructed for existing approved mining operations maintain streamflow	No impact; no AVFs; closed drainage prevents streamflow	No impact; no AVFs; stream diversions constructed to maintain streamflow
3.7 Wetlands			
Removal of jurisdictional wetlands and loss of wetland function until reclamation occurs	Moderate, permanent on 0.73 acre of potentially jurisdictional wetlands; no net loss	Moderate, permanent on 1.21 acres of potentially jurisdictional wetlands; no net loss	Moderate, permanent on 1.89 acres of potentially jurisdictional wetlands; no net loss
Removal of nonjurisdictional wetlands	No impact; all non-wetlands	No impact; all non-wetlands	No impact; all non-wetlands

Table 3.0-2. Continued

Description of Potential Impact by Resource	Magnitude[a] and Duration[b] of Impact[c]		
	No Action Alternative[d]	Action Alternatives[e]	
	Alternative 1	Proposed Action[f]	Alternative 2[g]
3.8 SOILS			
Changes in physical properties after reclamation would include:			
▪ Increased near surface bulk density and decreased soil infiltration rate resulting in increased potential for soil erosion	Moderate, long-term on 656 acres	Moderate, long-term on 1,134 acres	Moderate, long-term on up to 2,847 acres
▪ More uniformity in soil type, thickness, and texture	Moderate, beneficial, long-term on 656 acres	Moderate, beneficial, long-term on 1,134 acres	Moderate, beneficial, long-term on up to 2,847 acres
▪ Decreased runoff due to topographic modification	Moderate, beneficial, long-term on 656 acres	Moderate, beneficial, long-term on 1,134 acres	Moderate, beneficial, long-term on up to 2,847 acres
Changes in biological properties in soils that are stockpiled before reclamation would include:			
▪ Reduction in organic matter	Moderate, short- to long-term on 656 acres	Moderate, short- to long-term on 1,134 acres	Moderate, short- to long-term on up to 2,847 acres
▪ Reduction in microorganism population	Moderate, short- to long-term on 656 acres	Moderate, short- to long-term on 1,134 acres	Moderate, short- to long-term on up to 2,847 acres
▪ Reduction in seeds, bulbs, rhizomes, and live plant parts	Moderate, short- to long-term on 656 acres	Moderate, short- to long-term on 1,134 acres	Moderate, short- to long-term on up to 2,847 acres
Changes in chemical properties would include:			
▪ More uniform soil nutrient distribution	Moderate, beneficial, long-term on 656 acres	Moderate, beneficial, long-term on 1,134 acres	Moderate, beneficial, long-term on up to 2,847 acres
3.9 VEGETATION			
During mining:			
▪ Progressive removal of existing vegetation	Moderate, short-term on 656 acres	Moderate, short-term on 1,134 acres	Moderate, short-term on up to 2,847 acres
▪ Increased erosion	Moderate, short-term on 656 acres	Moderate, short-term on 1,134 acres	Moderate, short-term on up to 2,847 acres
▪ Wildlife habitat and livestock grazing loss	Moderate, short-term on 656 acres	Moderate, short-term on 1,134 acres	Moderate, short-term on up to 2,847 acres

Table 3.0-2. Continued

Description of Potential Impact by Resource	Magnitude[a] and Duration[b] of Impact[c]		
	No Action Alternative[d]	Action Alternatives[e]	
	Alternative 1	Proposed Action[f]	Alternative 2[g]
After revegetation:			
▪ Changes in vegetation patterns	Negligible, long-term on 656 acres	Negligible, long-term on 1,134 acres	Negligible, long-term on up to 2,847 acres
▪ Reduction in vegetation diversity	Negligible, long-term on 656 acres	Negligible, long-term on 1,134 acres	Negligible, long-term on up to 2,847 acres
▪ Reduction in shrub density	Minor, long-term on 86 noncontiguous acres; average patch size 4.9 acres	Minor, long-term on 4,126 noncontiguous acres; average patch size 4.9 acres	Minor, long-term on 302 noncontiguous acres; average patch size 4.9 acres
▪ Decreased big game habitat carrying capacity	Minor, long-term on 656 acres	Minor, long-term on 1,134 acres	Minor, long-term on up to 2,847 acres
▪ Decreased habitat for shrub-dependent species	Minor, long-term on 86 noncontiguous acres; average patch size 4.9 acres	Minor, long-term on 126 noncontiguous acres; average patch size 4.9 acres	Minor, long-term on 302 noncontiguous acres; average patch size 4.9 acres
▪ Potential invasion of nonnative plant species	Moderate, short-term on 656 acres	Moderate, short-term on 1,134 acres	Moderate, short-term on up to 2,847 acres
3.10 WILDLIFE			
Big game displacement from active mining areas	Minor to moderate, short-term on 656 acres for pronghorn and mule deer; no elk or white-tailed deer present	Minor to moderate, short-term on 1,134 acres for pronghorn and mule deer; no elk or white-tailed deer present	Minor to moderate, short-term on up to 2,847 acres for pronghorn and mule deer; no elk or white-tailed deer present
Decreased big game habitat carrying capacity	Minor, long-term on 656 acres for pronghorn and mule deer; no elk or white-tailed deer present	Minor, long-term on 1,134 acres for pronghorn and mule deer; no elk or white-tailed deer present	Minor, long-term on up to 2,847 acres for pronghorn and mule deer; no elk or white-tailed deer present
Increased competition on adjacent undisturbed or reclaimed lands, especially big game	Minor to moderate for pronghorn and mule deer; no elk or white-tailed deer present	Moderate, short-term for pronghorn and mule deer; no elk or white-tailed deer present	Moderate, short-term for pronghorn and mule deer; no elk or white-tailed deer present
Restriction of wildlife movement, especially big game	Moderate, short-term on 656 acres for pronghorn and mule deer; no elk or white-tailed deer present	Moderate, short-term on 1,134 acres for pronghorn and mule deer; no elk or white-tailed deer present	Moderate, short-term for pronghorn and mule deer; no elk or white-tailed deer present
Increased mortality of small mammals	Moderate, short-term on 656 acres	Moderate, short-term on 1,134 acres	Moderate, short-term on up to 2,847 acres
Displacement of small- and medium-sized mammals	Moderate, short-term on 656 acres	Moderate, short-term on 1,134 acres	Moderate, short-term on up to 2,847 acres

Table 3.0-2. Continued

Description of Potential Impact by Resource	Magnitude[a] and Duration[b] of Impact[c]		
	No Action Alternative[d]	Action Alternatives[e]	
	Alternative 1	Proposed Action[f]	Alternative 2[g]
Surface and noise disturbance of occupied sage-grouse leks	No surface impact; minor, short-term noise impact; one sage-grouse lek within 0.5 mile; last active in 2001, confirmed inactive in 13 of last 14 years	No surface impact; minor, short-term noise impact; one sage-grouse lek within 0.5 mile; last active in 2001, confirmed inactive in 13 of last 14 years	No surface impact; minor, short-term noise impact; one sage-grouse lek within 0.5 mile; last active in 2001, confirmed inactive in 13 of last 14 years
Disturbance of potential sage-grouse nesting habitat during mining	Minor, long-term on 86 noncontiguous acres; average patch size 4.9 acres	Minor, long-term on 4,126 noncontiguous acres; average patch size 4.9 acres	Minor, long-term on 302 noncontiguous acres; average patch size 4.9 acres
Loss of sage-grouse nesting habitat after reclamation	Minor, long-term on 86 noncontiguous acres; average patch size 4.9 acres	Minor, long-term on 126 noncontiguous acres; average patch size 4.9 acres	Minor, long-term on 302 noncontiguous acres; average patch size 4.9 acres
Alteration of plant and animal communities after reclamation	Minor, short-term on 656 acres	Minor, short-term on 1,134 acres	Minor, short-term on up to 2,847 acres
Abandonment of raptor nests	Minor, short-term; one intact nest present	Minor, short-term; one intact nest present	Minor, short-term; three intact nests present
Loss of foraging habitat for raptors	Minor, short-term on 656 acres	Minor, short-term on 1,134 acres	Moderate, short-term on up to 2,847 acres
Loss of nesting, roosting, and foraging habitat for Migratory Bird Species of Management Concern (including the bald eagle)	Minor, short-term on 656 acres	Minor, short-term on 1,134 acres	Moderate, short-term on up to 2,847 acres
Reduction in waterfowl nesting and feeding habitat	Negligible, short-term on 656 acres; few water bodies present, ephemeral or limited seasonal presence	Negligible, short-term on 1,134 acres; few water bodies present, ephemeral or limited seasonal presence	Negligible, short-term on up to 2,847 acres; few water bodies present, ephemeral or limited seasonal presence
Loss of habitat for aquatic species during mining	Negligible, short-term on 656 acres; few water bodies present, ephemeral or limited seasonal presence	Negligible, short-term on 1,134 acres; few water bodies present, ephemeral or limited seasonal presence	Negligible, short-term on up to 2,847 acres; few water bodies present, ephemeral or limited seasonal presence
Road kills by mine-related traffic	Minor, short-term	Minor, short-term	Minor, short-term
Reduction in habitat carrying capacity and habitat diversity on reclaimed lands	Minor, short-term on 656 acres	Minor, short-term on 1,134 acres	Minor, short-term on up to 2,847 acres
Potential reduction in microhabitats on reclaimed lands	Minor to moderate, long-term on 656 acres	Minor to moderate, long-term on 1,134 acres	Minor to moderate, long-term on up to 2,847 acres

Table 3.0-2. Continued

Description of Potential Impact by Resource	Magnitude[a] and Duration[b] of Impact[c]		
	No Action Alternative[d]	Action Alternatives[e]	
	Alternative 1	Proposed Action[f]	Alternative 2[g]
Threatened, Endangered, Proposed, And Candidate Species (Appendix J)			
Blowout penstemon	No effect	No effect	No effect
Ute ladies'-tresses	No effect	No effect	No effect
Greater sage-grouse	Minor, long-term	Minor, long-term	Minor, long-term
3.11 Land Use and Recreation			
Reduction of livestock grazing	Moderate, short-term on 656 acres	Moderate, short-term on 1,134 acres	Moderate, short-term on up to 2,847 acres
Loss of wildlife habitat	Negligible to moderate, short- to long-term on 656 acres	Negligible to moderate, short- to long-term on 1,134 acres	Negligible to moderate, short- to long-term on up to 2,847 acres
Loss of access for subcoal oil and gas development	Minor, short-term for access on 656 acres	Moderate, short-term for access on 419 acres; minor, short-term for access on 715 surface acres	Moderate, short-term for access on up to 1,883 acres; minor, short-term for access on up to 964 surface acres
Removal of oil and gas production facilities	Moderate, short-term for CBNG access on 656 acres; no impact on conventional oil and gas production	Moderate, short-term for CBNG access on 1,134 acres; no impact on conventional oil and gas production	Moderate, short-term for CBNG access on up to 2,847 acres; no impact on conventional oil and gas production
Loss of access to public land available for recreation and grazing	No impact; entirely private surface	No impact; entirely private surface	No impact; entirely private surface
3.12 Cultural Resources and Native American Consultation			
Cultural Resources			
▪ Sites that are not eligible for NRHP	No impact; ineligible sites discovered during operations may be destroyed without protection or further work	No impact; up to 14 known ineligible sites and additional ineligible sites discovered during operations may be destroyed without protection or further work	No impact; up to 14 known ineligible sites and additional ineligible sites discovered during operations may be destroyed without protection or further work
▪ Sites that are eligible for NRHP	No impact on known sites; impacts on eligible sites discovered during operations would be avoided or mitigated through data recovery prior to mining	No impact on known sites; impacts on eligible sites discovered during operations would be avoided or mitigated through data recovery prior to mining	No impact on known sites; impacts on eligible sites discovered during operations would be avoided or mitigated through data recovery prior to mining

Table 3.0-2. Continued

Description of Potential Impact by Resource	Magnitude[a] and Duration[b] of Impact[c]		
	No Action Alternative[d]	Action Alternatives[e]	
	Alternative 1	Proposed Action[f]	Alternative 2[g]
▪ Sites that are unevaluated for NRHP eligibility	No impact on known unevaluated sites; impacts on unevaluated sites are not permitted; unevaluated sites would be evaluated prior to mining	No impact on known unevaluated sites; impacts on eligible sites discovered during operations would be avoided or mitigated through data recovery prior to mining	No impact on known unevaluated sites; impacts on eligible sites discovered during operations would be avoided or mitigated through data recovery prior to mining
Native American heritage sites	No impact on known sites	No impact on known sites	No impact on known sites
3.13 Visual Resources			
During mining:			
▪ Alteration of landscape by mining facilities and operations	Moderate, short-term on 656 acres	Moderate, short-term on 1,134 acres	Moderate, short-term on up to 2,847 acres
▪ Visibility of mining operations from highway	Moderate, short-term; highway is 0.5 to 2.5 miles away	Moderate, short-term; highway is ≥1 mile away	Moderate, short-term; highway 0.5 to 1.5 miles away
Following reclamation:			
▪ Smoother sloped terrain	Minor to moderate, permanent on 656 acres	Minor to moderate, permanent on 1,134 acres	Minor to moderate, permanent on up to 2,847 acres
▪ Reduction in sagebrush density	Minor, long-term on 86 noncontiguous acres	Minor, long-term on 126 noncontiguous acres	Minor, long-term on 302 noncontiguous acres
3.14 Noise			
Increased noise levels	Minor to substantial, short-term; one occupied residence within 0.25 mile, most homes ≥1 mile away on far side of active roads or hills for audio buffer	Minor to substantial, short-term; <0.25 mile to nearest occupied residence; most homes on far side of active roads or hills for audio buffer	Minor to substantial, short-term; one occupied residence in operationally limited lands within general analysis area; most homes on far side of active roads or hills for audio buffer
3.15 Transportation Facilities			
Use of railroads to ship coal	Moderate, short-term	Moderate, short-term	Moderate, short-term
Employee and service contractor use of highways to and from mine sites	Moderate, short-term	Moderate, short-term	Moderate, short-term
Relocation of pipelines	No impact; all lines already addressed	Moderate, short-term; four existing pipelines and one potential new easement affected	Moderate, short-term; six existing pipelines and one potential new easement affected

Table 3.0-2. Continued

Description of Potential Impact by Resource	Magnitude[a] and Duration[b] of Impact[c]		
	No Action Alternative[d]	Action Alternatives[e]	
	Alternative 1	Proposed Action[f]	Alternative 2[g]
Relocation of utility lines	Negligible, short-term; all or most lines already addressed	Minor, short-term; three overhead power lines affected, both within existing permit area	Minor, short-term; eight overhead power lines affected, seven in existing permit area
Mining operations near Collins and McGee roads	Minor , short-term; 0.25 mile along one county road; no roads expected to be closed or relocated	Minor to substantial, short-term; 0.6 mile along one county road; no roads expected to be closed or relocated	Minor to substantial, short-term; approximately 3 miles along two county roads; no roads expected to be closed or relocated
3.16 Hazardous and Solid Waste			
Waste generated by mining operations	Negligible, short-term	Negligible, short-term	Negligible, short-term
3.17 Socioeconomics			
Employment	Negligible, beneficial, short-term; new hires expected for existing operations	Negligible, beneficial, short-term; no new hires expected; current employment levels extended for 2 years	Negligible, beneficial, short-term; no new hires expected; current employment levels extended for up to 6 years
Revenues from royalties and taxes to the state and local government	Substantial, beneficial short-term	Substantial, beneficial, short-term	Substantial, beneficial, short-term
Revenues from royalties and taxes to the federal government	Substantial, beneficial short-term	Substantial, beneficial, short-term	Substantial, beneficial, short-term
Economic development	Moderate, beneficial short-term	Moderate, beneficial, short-term	Moderate, beneficial, short-term
Additional housing and infrastructure needs	No impact	No impact	No impact
Population	No impact	No impact	No impact
Local government facilities and services	No impact	Negligible, short-term; no new demands; extends current demands by 2 years	Negligible, short-term; no new demands; extends current demands by up to 6 years
Social setting	No impact	Negligible, beneficial, short-term; extends current benefits by 2 years	Negligible, beneficial, short-term; extends current benefits by up to 6 years
Environmental justice	No impact	No impact	No impact

Table 3.0-2. Continued

Description of Potential Impact by Resource	Magnitude[a] and Duration[b] of Impact[c]		
	No Action Alternative[d]	Action Alternatives[e]	
	Alternative 1	Proposed Action[f]	Alternative 2[g]

CBNG = coal bed natural gas; mmt = million tons; NO_x = oxides of nitrogen; NO_2 = nitrogen dioxide; ; VRM = visual resource management; SO_2 = sulfur dioxide; AVF = alluvial valley floor; NRHP = National Register of Historic Places

[a] Refer to sections 3.2 through 3.17 for discussions on magnitude of impacts for each resource under each alternative.

[b] Short-term impacts are operational impacts that persist during mining (life of mine) and reclamation. The current life-of-mine estimate (No Action Alternative) is 14 years; under the Proposed Action, the life-of-mine would extend two years beyond the current estimate; under Alternative 2, life-of-mine would be extended by up to six years beyond the current estimate. Long-term impacts persist through the time the reclamation bond is released—a minimum of 10 years beyond active reclamation. Permanent impacts persist beyond reclamation.

[c] All impacts are assumed adverse unless noted otherwise.

[d] Impacts under the No Action Alternative apply to the overlap area. These impacts would be limited to disturbance associated with mine support activities (e.g., topsoil stripping) and reclamation activities, described in section 1.1.3.3 and section 1.1.3.4, respectively, for currently permitted mining in existing coal leases.

[e] Kiewit has no plans to mine operationally limited lands. However, impacts presented in this table consider maximum potential disturbance under each alternative.

[f] Under the Proposed Action, coal extraction would occur in the entire proposed tract (419 acres). Activities related to mining and reclaiming (described in section 1.1.3.3 and section 1.1.3.4, respectively) the proposed tract would occur in the support area, a 0.25-mile-wide area north and west of the proposed tract (241 acres); activities related to mining the existing coal lease would occur in the remainder of the overlap area (474 acres).

[g] Under Alternative 2, coal extraction would occur in an alternative tract configuration within the BLM study area (up to 1,883 acres). Activities related to mining in the BLM study area would occur in the support area, a 0.25-mile-wide area north and west of the BLM study area (up to 926 acres); activities related to mining existing coal leases would continue in the remainder of the overlap area (38 acres). These areas comprise the maximum potential disturbance analyzed in this EIS, referred to throughout as the general analysis area.

3.1. General Setting

This section provides an overview of the physical setting and climatic characteristics of the general analysis area and surrounding region.

3.1.1. General Location and Characteristics

The general analysis area is adjacent to one of the northern-most operating mines in the PRB, in the part of the Northern Great Plains that includes most of northeastern Wyoming. This region is also within the Great Plains Steppe and Shrub Province of the Dry Domain ecoregion of the continent (USDA Forest Service 2009). Ecoregions are comprised of large areas of similar climate where ecosystems are present in predictable patterns. The defining characteristic of a dry climate is that annual losses of water through evaporation at the earth's surface exceed annual water gains from precipitation. As a result of that overall water deficiency, no permanent streams originate in dry climate zones. The Dry Domain ecoregion is the most extensive in the world, and occupies one-quarter or more of the earth's land surface.

Wyoming has a relatively cool climate due to its elevation. Away from the mountains, the mean maximum temperatures in July range between 85 and 95 degrees Fahrenheit (°F) and the mean minimum temperatures that month range from 50 to 60 °F (National Oceanic and Atmospheric Administration 1985). January is typically the coldest month, with minimum temperatures often ranging from 5 to 10 °F. Early freezes in the fall and late in the spring are characteristic of the state, and result in long winters and short (average 125 days) growing seasons. Sunshine dominates approximately 60% of winter days and about 75% of summer days. Spring and summer are the wettest months, though rainfall amounts are highly variable and can be somewhat localized. Relative humidity ranges from 5 to 75%, depending on the season, with an average of 25 to 30% on the warmer summer days. Wyoming is quite windy, with frequent periods of sustained wind speeds of 30 to 40 miles per hour (mph) and regular gusts exceeding 60 mph. Snow typically falls from November through May, with periodic accumulations of more than 10 feet in the mountains and more moderate levels of snowfall and accumulation at lower elevations. The low relative humidity, high percentage of sunshine, and higher average winds all contribute to a high rate of evaporation across the state.

The vegetation in the general analysis area consists of species common to eastern Wyoming and is consistent with vegetative communities in the adjacent Buckskin Mine permit area. The proposed tract is dominated (approximately 71%) by various upland grasslands. The general analysis area is comprised primarily of upland grasslands (approximately 40%) and agricultural lands (croplands and pastures, 31%). Section 3.9 provides a detailed discussion on vegetation resources.

3.1.2. Climate and Meteorology in the General Analysis Area

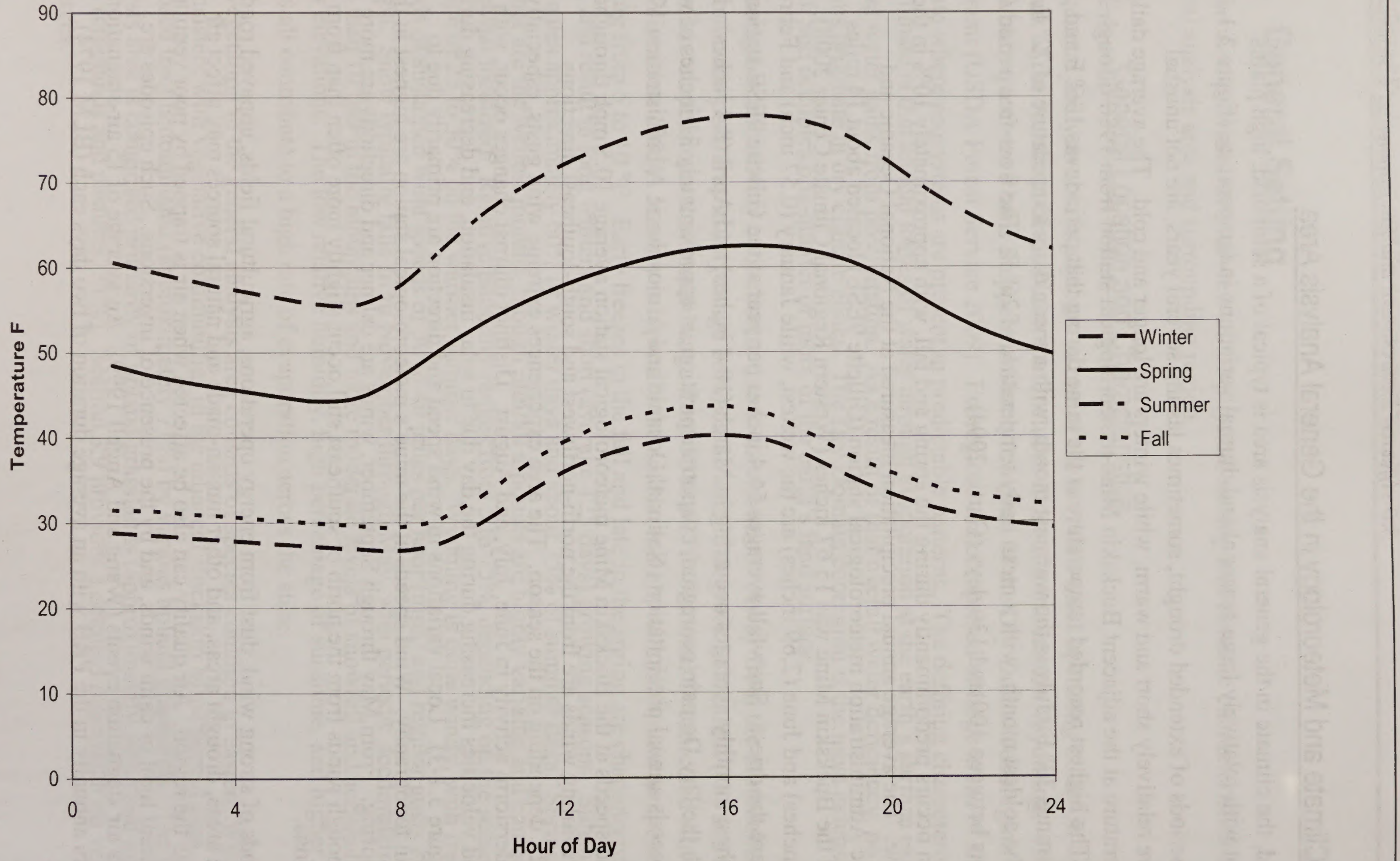
As indicated, the climate in the general analysis area is typical of a semi-arid, high plains environment with relatively large seasonal and diurnal variations in temperature (figure 3.1-1).

Recurring periods of extended drought, sometimes lasting several years, are not unusual. Summers are relatively short and warm, while winters are longer and cold. The average daily mean temperature at the adjacent Buckskin Mine meteorological station from 1986 through 2007 was 46° F. The highest recorded temperature at the mine during that period was 106° F and the lowest was minus 33° F. July is the warmest month, with a mean daily temperature of 72° F, and January is the coldest month, with a mean daily temperature of 26° F. The frost-free period for this area lasts between 100 and 130 days (Curtis 2004).

Precipitation occurs predominantly during the spring and fall, with approximately 10% in the form of snow. The average annual precipitation measured at the National Oceanic and Atmospheric Administration meteorological station (Gillette 9ESE) located about 14 miles southeast of the Buckskin Mine was 15.67 inches (Western Regional Climate Center 2008). May (2.67 inches) and June (2.69 inches) are the wettest, while January (0.57 inch) and February (0.56 inch) are the driest. Snowfall averages 56.4 inches per year at the Gillette 9ESE station, with the highest monthly averages occurring in March (10.4 inches) and April (8.4 inches). In keeping with the Dry Domain ecoregion, evapotranspiration, at approximately 31 inches of water per year, exceeds annual precipitation (National Oceanic and Atmospheric Administration 1969).

Surface wind speeds at the Buckskin Mine meteorological station average 10.5 mph throughout the year. Prevailing winds are from the north-northwest and south-southeast directions (figure 3.1-2), depending on the season. The area experiences extreme wind gusts, especially during thunderstorm activity in June, July, and August. Distinct diurnal changes occur, with average wind velocities increasing during the day due to solar insulation, and decreasing during the night (figure 3.1-3). Local variations in wind speed and direction are primarily due to differences in topography. Wind speeds at the mine's meteorological station are highest in the winter and spring. From May through September, winds are calmer and directions are more random, although winds from the north or southeast still occur slightly more often than from other directions.

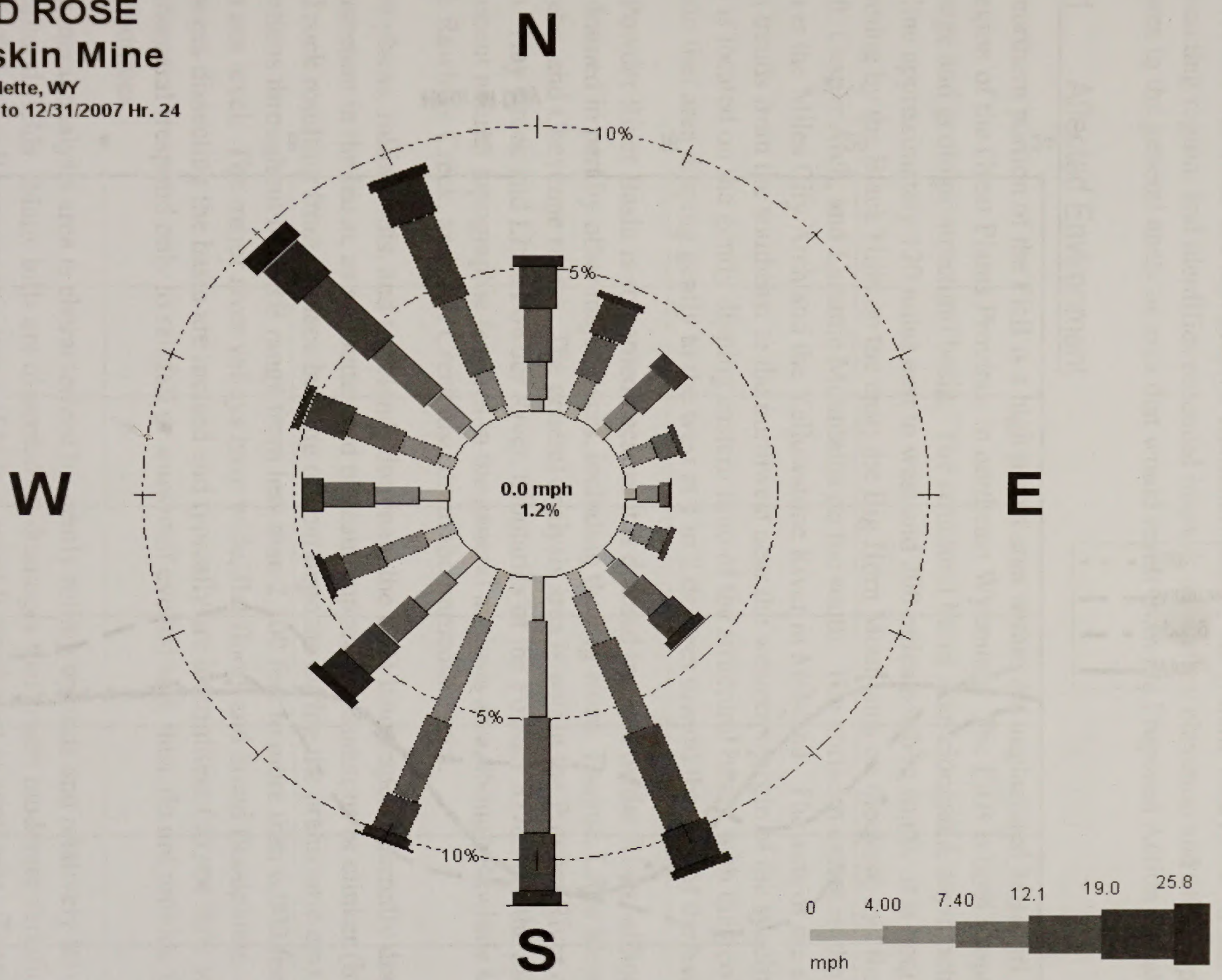
During periods of strong wind, dust from energy operations, agricultural fields, unpaved roads, construction areas, drought areas, and other human-made and natural sources may affect air quality across the region. Air quality can also be affected when air is trapped by poor ventilation due to persistent light or calm winds, and by the presence of inversions. Such episodes are referred to as air stagnation events (Wang and Angell 1999). An average of 15 air-stagnation events occurs annually in the PRB with an average duration of two days each (BLM 1974).



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

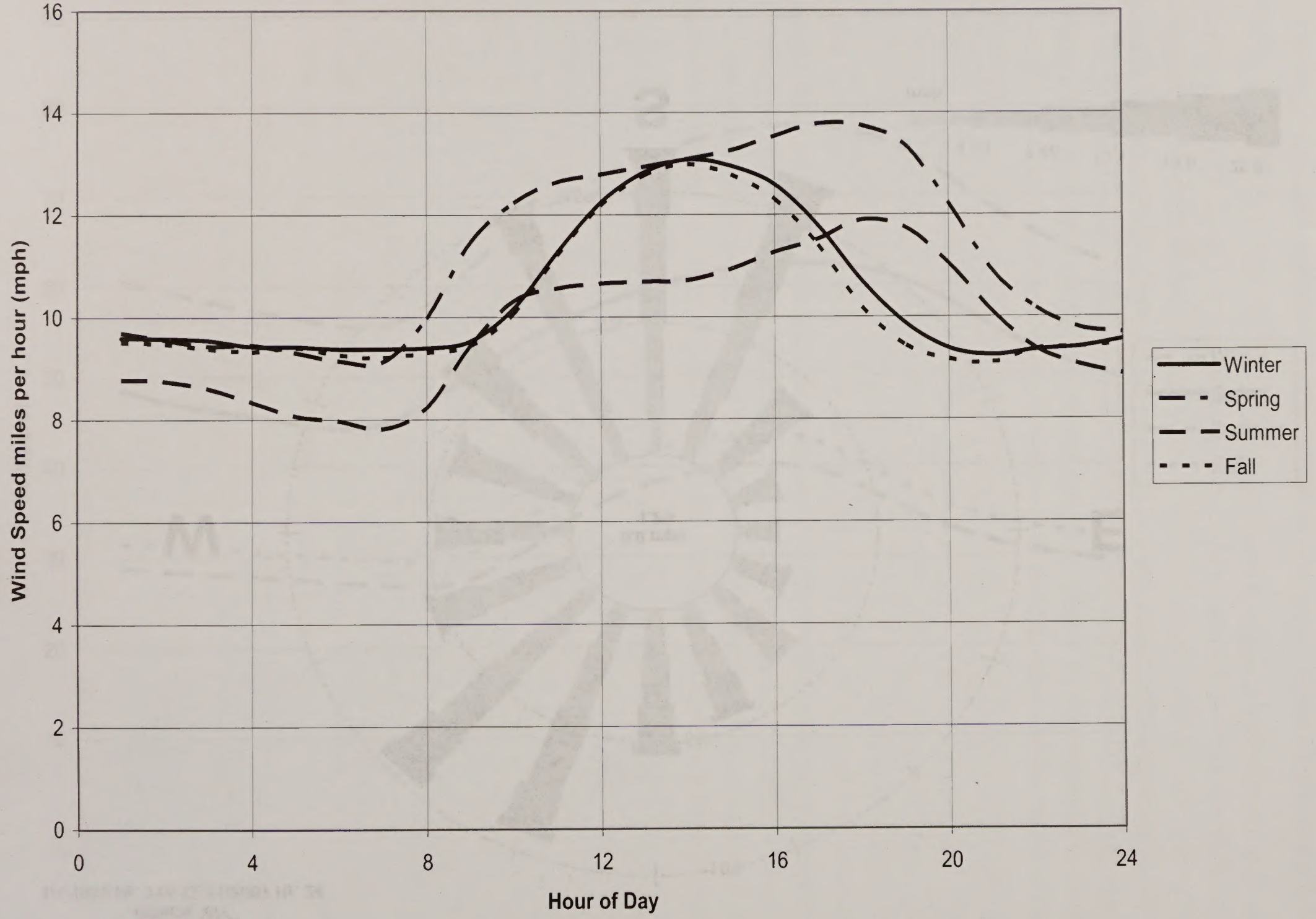
Figure 3.1-1
Average Diurnal Temperature by Season at Buckskin Mine

WIND ROSE
Buckskin Mine
Gillette, WY
1/1/1988 Hr. 1 to 12/31/2007 Hr. 24



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Figure 3.1-2
Wind Rose for the Buckskin Mine



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Figure 3.1-3

Average Diurnal Wind Speed by Season at the Buckskin Mine

3.2. Topography

This section describes the topographic characteristics of the general analysis area and surrounding region, and identifies potential impacts on surface elevation and other topographic features in the general analysis area that would result from the Proposed Action and alternatives.

3.2.1. Affected Environment

The northern portion of the PRB is a high plains area within the unglaciated Missouri Plateau subregion of the Great Plains Province in northeast Wyoming. The PRB is both a topographic drainage and geologic structural basin. The structural basin is an elongated, asymmetrical syncline approximately 120 miles east to west and 200 miles north to south. It is bounded in Wyoming by the Black Hills on the east; the Big Horn Mountains on the west; and the Hartville Uplift, Casper Arch, and Laramie Mountains on the south. The northern extent of the structural basin is the Miles City Arch and the Yellowstone River in Montana. The axis of the structural basin trends from the southeast to the northwest near the western margin of the syncline. The PRB is located on the gently dipping eastern limb of the structural basin, with the geological stratain that area dipping gently to the west at 1 to 2 degrees toward the axis of the basin.

The Powder River Basin is so named because it is drained by the Powder River, although it is also drained in part by other major rivers, including the Big Horn, Tongue, Little Missouri, Belle Fourche, and Cheyenne rivers. The general analysis area is within the Powder River drainage basin. Hay Creek and Little Powder River, tributaries of the Powder River, are the most prominent natural topographic features in the general analysis area, though Rawhide Creek, Little Rawhide Creek, and Calf Creek also drain the immediate area.

Broad plains, rolling hills, and tablelands dominate the PRB landscape. Internally drained playas are common in the basin, as are buttes and plateaus capped by sandstone or clinker (baked and fused rock resulting from in-place burning of coal deposits during the prehistoric era). Elevations throughout the PRB range from less than 2,500 feet to more than 6,000 feet above mean sea level. The major river valleys have wide, flat floors and broad floodplains. The drainages dissecting the basin are incised and typically are intermittent (do not flow year-round) or ephemeral (respond only to rainfall or snowmelt events) and, thus, do not provide year-round water sources.

The general analysis area is characterized by gently rolling uplands and relatively level agricultural fields. Many hills are dissected by drainages that create moderate variations in local relief. The overall topographic trend of hills is roughly northwest to southeast. Topography in the southern portion of the general analysis area exhibits a local southwest-to-northeast trend associated with an ephemeral drainage in sections 18 and 19. Map 3.0-1 identifies sections in the general analysis area.

Slopes range from flat in the northwestern part of the general analysis area to greater than 30% in the northeast. Topographic elevations range from about 4,080 feet above mean sea level along Hay Creek in section 16 (northeast) to about 4,380 feet above mean sea level in the east-central

portion of section 19 (southwest). Local relief is greatest in sections 8 and 9 (north-northeast), where drainages deeply dissect the uplands and create relatively steep slopes and prominent bluffs of sandstone that are resistant to erosion. The flattest portion of the general analysis area is in the broad valley bottom of Hay Creek in the north-central portion of section 18. A topographic depression encompassing about 8.8 acres is located in the west-central portion of that section.

3.2.2. Environmental Consequences

3.2.2.1. *Proposed Action*

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) would have a moderate, permanent impact on surface elevation. Activities in the support area (241 acres) would have no impact on surface elevation. Activities in the remainder of the overlap area (474 acres) related to mining existing coal leases also would have no impact on surface elevation.

Activities such as blasting, hauling, and stockpiling would remove overburden and interburden to a combined average depth of approximately 250 feet, and coal to a combined total depth of about 100 additional feet in the proposed tract. The postmining topography would be recontoured to resemble the premining topography, but would be approximately 60 feet lower (table 3.2-1) and somewhat gentler and more uniform.

In addition, activities related to mining the proposed tract and existing leases would result in indirect impacts, described below, in the support area and remainder of the overlap area, respectively.

Impacts resulting from topographic moderation include minor to moderate, long-term reductions in microhabitats (e.g., cutbank slopes) and habitat diversity. These impacts would be greater in those areas characterized as rough breaks, though these areas constitute less than 0.5% of the general analysis area. Potential effects of topographic moderation on wildlife species are described in section 3.10. A beneficial, long-term impact of the lower and flatter terrain would be reduced water runoff, which would allow for moderate increases in infiltration and a moderate reduction in peak flows. This may help counteract the potential for increased erosion that could occur because of higher density of reclaimed soils near the surface (section 3.8.2.1). It may also increase vegetative productivity and potentially accelerate recharge of groundwater. In-channel stockponds and playas (i.e., shallow topographic depressions) would be replaced to provide livestock and wildlife watering sources. These topographic changes would not conflict with regional land use, and the postmining topography would be designed to adequately support the anticipated future land use. All postmining topography and water features must meet the specifications outlined in the mining and reclamation plan approved by the WDEQ.

Table 3.2-1. Overburden/Coal Thickness and Postmining Elevation Change

Average overburden thickness (including interburden)	250 feet
Average coal thickness	100 feet
Overburden swell factor	11%
Coal recovery factor	90%
Postmining elevation change[a]	–61 feet

[a] Reclaimed (postmining) elevation surface change is calculated as:
(overburden + unrecovered coal thicknesses) x (overburden swell) – (overburden + coal thicknesses).

3.2.2.2. *Alternative 1 (No Action)*

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have no impact on surface elevation. Impacts on other characteristics associated with topographic changes would be the same as described under the Proposed Action. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

3.2.2.3. *Alternative 2*

Under Alternative 2, surface coal mining in the BLM study area (up to 1,883 acres) would have a moderate, permanent impact on surface elevation. Activities in the support area (926 acres) would have no impact on surface elevation. Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases also would have no impact on surface elevation. Impacts on other characteristics associated with topographic changes would be the same as described under the Proposed Action.

3.2.3. Regulatory Compliance, Mitigation, and Monitoring

Chapter 4 of the WDEQ Rules and Regulations requires that topography be restored as closely as possible to premining contour and that it blend into the existing, undisturbed topography as much as possible. Despite these efforts, some local relief would be reduced after coal removal. The amount of coal that would be removed and the degree to which the overburden spoils would change in volume due to excavation would be considered in the postmine topography design. These designs will be developed for approval as part of the required mining and reclamation plans. All topographic features such as upland draws, channel bottoms, and elevations will be reconstructed to closely mimic premining conditions and ensure proper drainage of water across the reclaimed spoils. The WDEQ monitors topographic restoration for at least 10 years postmining by regularly checking the as-built topography in the annual reports filed by the mines to see if it conforms to the approved topography.

Under either of the action alternatives, Kiewit will reestablish vegetation in all reclaimed areas and implement sediment-control measures where runoff occurs to preserve reclaimed materials.

Kiewit will monitor success of revegetation and erosion-control measures routinely, per WDEQ guidelines, and will implement mitigation measures, as necessary, to correct any deficiencies.

3.2.4. Residual Impacts

Topographic moderation is a permanent consequence of mining. Reclaimed landforms are expected to mimic premining topography, but will have less topographic variation and will be slightly lower in elevation. Any indirect impacts of topographic moderation on wildlife habitat diversity would also be considered permanent. See section 3.10 for indirect impacts on wildlife as a result of topographic moderation.

3.3. Geology, Mineral Resources, and Paleontology

This section discusses the topographic, geologic, and mineral resources in the general analysis area and adjacent Buckskin Mine permit area, including assessments of premine topography and pertinent information regarding geology, as well as coal, CBNG, and clinker resources, referred to locally as scoria or red dog. It also identifies potential impacts on these resources that would result from the Proposed Action and alternatives.

3.3.1. General Geology and Coal Resources

3.3.1.1. *Affected Environment*

The general analysis area contains the following stratigraphic units (layers) (in descending order from the surface): Quaternary (recent) deposits, the Eocene Wasatch Formation, and the Paleocene Fort Union Formation. The Paleocene Fort Union Formation contains the coal seams that would be mined under the action alternatives. Table 3.3-1 shows the stratigraphic relationships of the geologic units in the general analysis area. These stratigraphic units are discussed below.

Quaternary deposits in the general analysis area consist of unconsolidated stream-laid deposits, slope wash, wind-blown deposits, colluvium, residuum, and clinker. Stream-laid deposits occur in portions of the Hay Creek valley bottom and some associated upland draws beyond the general analysis area for this EIS. Those deposits consist of a loose mix of sand, gravel, and silt deposited by stream flow within Hay Creek and its tributaries. Slope wash occurs along the bottom slopes of hills and in channel bottoms, including the Hay Creek valley bottom in section 18, and consists of reworked sediment deposited by flow over the ground surface (e.g., runoff). Some surface sands are concentrated into small areas comprised predominately of fine-grained sand. Residuum (residual material) deposits commonly cover and are derived in place from the underlying Wasatch deposits, and may occur on relatively steep terrain. Colluvium is comprised of material that has been transported downslope by rock falls, slides, and slumps, and occurs along steep hill sides. This material generally consists of large, angular clinker and rock fragments residing in an unsorted matrix of sand, silt, and clay. Materials above some of the shallow coal seams in the general analysis area have been altered by the natural combustion

(burning) of underlying coal seams, producing clinker. These clinker areas exist on limited hillsides along the northern portion of the general analysis area.

Table 3.3-1. Stratigraphic Relationships and Hydrologic Characteristics, Powder River Basin, Wyoming

Geologic Unit			Hydrologic Characteristics
Recent Alluvium (Holocene)			Typically fine grained and poorly sorted in intermittent drainages. Occasional very thin, clean, inter-bedded sand lenses. Low yields and excessive dissolved solids generally make these aquifers unsuitable for domestic, agricultural and livestock usage. Low infiltration capacity unless covered by sandy eolian blanket.
Clinker (Holocene to Pleistocene)			Baked and fused bedrock above the coal seam resulting from burning coal which ignites on the outcrop from lightning, manmade fires, or spontaneous combustion. The reddish clinker (locally called scoria or red dog) formed by melting and partial fusing of the layers above the coal from the burning coal. The baked rock varies greatly in the degree of alteration; some is dense and glassy while some is vesicular and porous. It is commonly used as a road construction material and is an aquifer wherever saturated.
Wasatch Formation (Eocene)			Lenticular fine sands inter-bedded predominantly very fine grained siltstone and claystone may yield low to moderate quantities of poor to good quality water. The discontinuous nature and irregular geometry of these sand bodies result in low overall permeabilities and very slow groundwater movement in the overburden on a regional scale. Water quality in the Wasatch formation generally does not meet Wyoming Class I drinking water standards due to the dissolved mineral content. Some wells do, however, produce water of considerably better quality which does meet the Class I standard.
Fort Union Formation (Paleocene)	Tongue River Member	Wyodak Formation Splits: Anderson/ Canyon Seams	The coal serves as a regional groundwater aquifer and exhibits highly variable aquifer properties. Permeability and porosity associated with the coal arise almost entirely from fractures. Coal water typically does not meet Class I or Class II (irrigation) use standards. In most cases, water from coal wells is suitable for livestock use. The coal water is used throughout the region as a source of stock water and occasionally for domestic use.
	Lebo Member		The Lebo Member, also referred to as "The Lebo Confining Layer," has a mean thickness of 711 feet in the PRB and a thickness of about 400 feet in the vicinity of Gillette. The Lebo typically yields small quantities of poor quality groundwater. Where sand content is locally large, caused by channel or deltaic deposits, the Lebo may yield as much as 10 gpm.
	Tullock Member		The Tullock Member has a mean thickness of 785 feet in the PRB and a mean sand content of 53% which indicates that the unit generally functions well as a regional aquifer. Yields of 15 gpm are common buy vary locally and may be as much as 40 gpm. Records from the State Engineer's Office indicate that maximum yields of approximately 300 gpm have been achieved from this aquifer. Water quality in the Tullock Member often meets Class I standards. The extensive sandstone units in the Tullock Member are commonly developed regionally for domestic and industrial uses. The City of Gillette is currently using eight wells completed in this zone to meet part of its municipal water requirements.
Lance Formation (Upper Cretaceous)	Upper Lance		Sandstone and interbedded sandy shales and claystone provide yields generally of less than 20 gpm. Higher yields are sometimes achieved where sand thicknesses are greatest. Water quality is typically fair to good.
	Fox Hills Sandstone		Sandstone and sandy shales yield up to 200 gpm, however, yields are frequently significantly less. The water quality of the Fox Hills is generally good with TDS concentrations commonly less than 1000 milligrams per liter.

Table 3.3-1. Continued

Geologic Unit		Hydrologic Characteristics
Lewis Formation (Upper Cretaceous)	Pierre Shale	This unit is comprised predominantly of marine shales with only occasional local thin sandstone lenses. Maximum yields are minor and overall the unit is not water bearing. Water obtained from this unit is poor, with high concentrations of sodium and sulfate as the predominant ions in solution.

gpm = gallons per minute

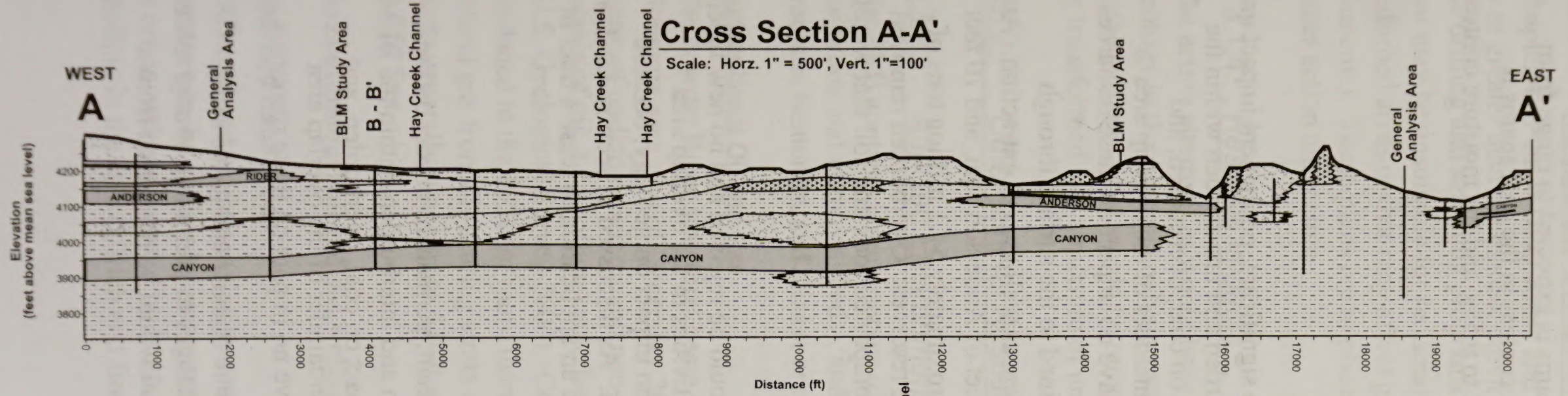
Sources: Hodson et al. 1973; Lewis and Hotchkiss 1981.

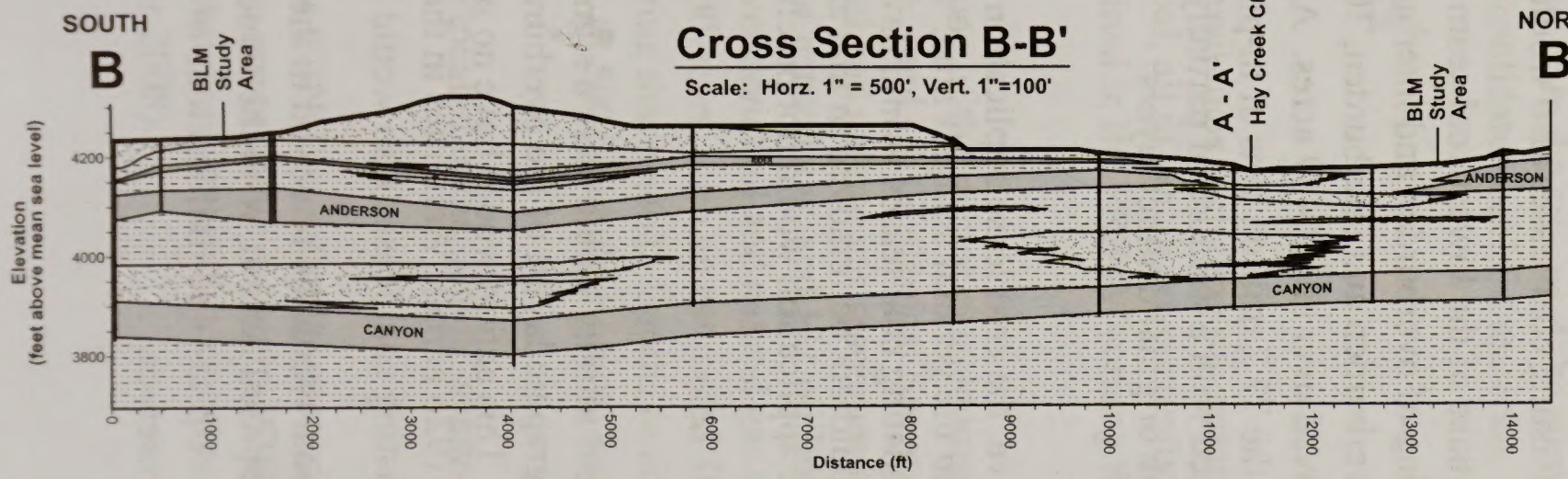
The Wasatch Formation in the general analysis area consists of sandstone, siltstone, shale, and thin coals that extend from the surface to the Anderson coal seam; that seam defines the top of the underlying Fort Union Formation. The Wasatch Formation is somewhat sandier than the underlying Fort Union Formation, especially near the surface, where sands can be traced laterally for considerable distances. The Rider coal seam occurs in the Wasatch Formation; it is present in much of the western portion of the general analysis area, but in the east the coal layer thins out, is eroded out, or is burned. The Rider seam is up to 15 feet thick in the general analysis area, but is not a target coal for mining.

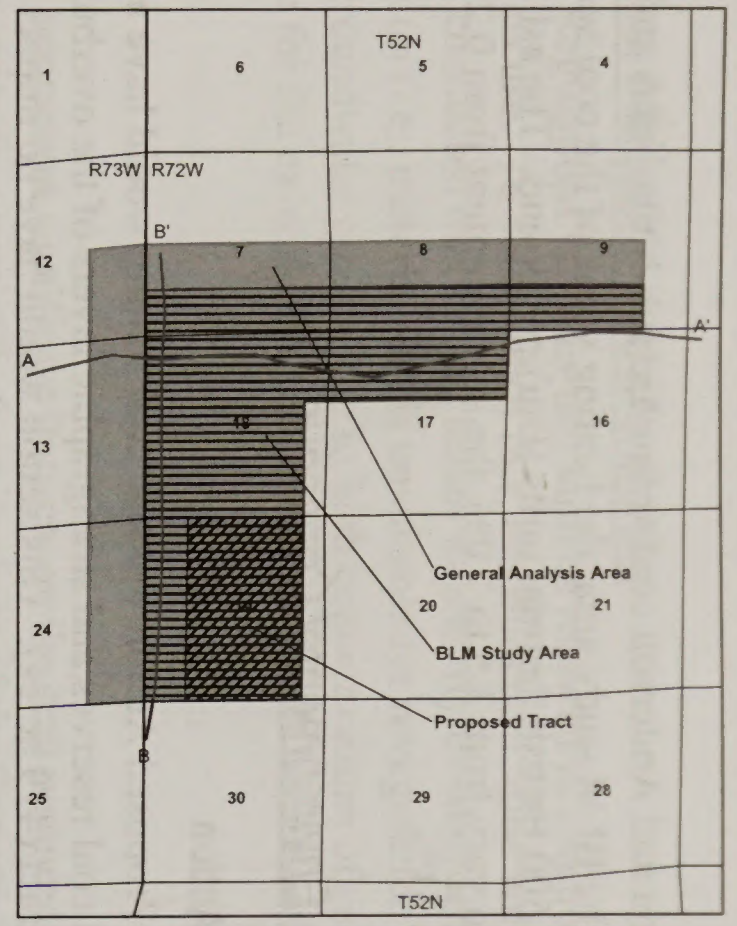
The Wasatch Formation, in combination with any overlying Quaternary deposits, is considered overburden relative to the shallowest (Anderson) coal seam that is targeted for mining in the general analysis area. The overburden thickness varies from about 30 to 200 feet. It is thinnest in low-lying draws in sections 8 and 9 and in the valley bottom of Hay Creek in section 18.

The Fort Union Formation lies between the Anderson and Canyon coal seams, and consists primarily of sandstones, siltstones, shales, mudstones, and coal. The formation is divided into the Tongue River, Lebo, and Tullock members. Two coal seams are present in the Tongue River Member of the Fort Union Formation, both of which are targeted for mining in the BLM study area (the maximum extent of leasable coal in the general analysis area). Two geologic cross sections through the proposed tract are shown on figure 3.3-1. The Anderson seam resides at the top of the Fort Union Formation and defines the contact between the Fort Union and the overlying Wasatch formations. The Canyon coal seam is lower in the Tongue River member, typically 150 to 190 feet beneath the Anderson, but it is within 40 feet of the Anderson where the seams are present in the northeastern portion of the BLM study area.

The Anderson coal seam is present in most of the western portion of the BLM study area (maximum coal lease boundary), but it is discontinuous and absent in most of the northern and eastern portions. Where present, it averages about 45 feet thick and ranges from about 30 to 65 feet thick. The Canyon coal seam is present in most of the western portion of the BLM study area, but it is absent in most of the eastern portion. Where present, it averages about 70 feet thick and ranges from about 55 to 75 feet thick.







Cross Section Location Map
SCALE: 1"=1.5 MILES

Legend

- Coal
- Clinker
- Sandstone/Sand
- Siltstone/Claystone

No warranty is made by the Bureau of Land Management for use of these data for purposes not intended by BLM.

Figure 3.3-1
North-South and East-West Geologic Cross Sections

The Canyon and Anderson coal seams are sub-bituminous and are generally low-sulfur, low-ash coals. In the BLM study area, the heating value of the coal seams is expected to range from 8,000 to 8,500 British thermal units (Btu) per pound. The ash content in the coal seams is expected to vary from 3.5 to 7.0%, the sulfur content from 0.2 to 0.5%, and the moisture content from 28 to 31%.

3.3.1.2. *Environmental Consequences*

Proposed Action

Under the Proposed Action, surface coal mining would have a significant, permanent impact on the federal coal reserves and stratigraphic layers of the overburden and interburden within the proposed tract (419 acres). This action would have no impact on coal, overburden, and interburden in the support area (241 acres); activities in the remainder of the overlap area (474 acres) related to mining existing coal leases also would have no impact on these resources.

Impacts would occur from the base of the lowest coal seam mined to the surface through blasting, hauling, and stockpiling of overburden and interburden, as well as coal extraction. An average of about 250 feet of overburden and interburden, 30 feet of Anderson coal, and 70 feet of Canyon coal would be removed over about 419 acres. Approximately 54.1 million tons of coal would be recovered from the 77.2 million tons of in-place reserves. Overburden removed during mining would be replaced with a mixture of partially compacted rock and soil that would be significantly altered from the original distinct layers.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have no impact on geology, because overburden and interburden would not be removed in that area. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the future.

Alternative 2

Under Alternative 2, surface coal mining would have a significant, permanent impact on the federal coal reserves and stratigraphic layers of the overburden and interburden within the BLM study area (up to 1,883 acres). This action would have no impact on coal, overburden, and interburden in the support area (926 acres). Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases also would have no impact on these resources.

Overburden, interburden, and coal would be removed in the same manner and to the same average depths as under the Proposed Action, with the same changes to premining stratigraphic layers and postmining backfill. Up to 149.7 million tons of coal would be recovered from 269.7 million tons of in-place reserves. .

3.3.1.3. Regulatory Compliance, Mitigation and Monitoring

Chapter 4 of the WDEQ Rules and Regulations requires that land be restored to conditions equal to or greater than the highest previous use. To accomplish this, the Buckskin Mine will continue the drilling and sampling programs conducted on existing leases to identify overburden material that may be unsuitable for reclamation (i.e., material that is unsuitable for revegetation in disturbed areas or that may affect groundwater quality due to high concentrations of certain elements). These plans are in place for the existing Buckskin Mine and will be revised under either action alternative.

3.3.1.4. Residual Impacts

The action alternatives would have permanent significant impacts on the coal resources and geology in the general analysis area extending vertically from the base of the Canyon coal seam to the surface. Coal would be removed from the area, and the current layered stratigraphy would be transformed into a mixture of unconsolidated backfill material.

3.3.2. Other Mineral Resources

3.3.2.1. Affected Environment

The PRB contains large reserves of fossil fuels including oil, natural gas (from conventional reservoirs and from coal beds), and coal, all of which are currently being produced. In addition, uranium, bentonite, and clinker are mined in the PRB (Wyoming State Geological Survey 2003).

Conventional Oil and Gas

The Powder River structural basin is one of the richest petroleum provinces in the Rocky Mountain area. As of December 2006, the U.S. Geological Survey (USGS) estimated the mean levels of undiscovered oil and non-coal bed natural gas resources in the PRB as 639 million barrels of oil, 1.16 trillion cubic feet of natural gas, and 131 million barrels of natural gas liquids (U.S. Geological Survey 2006). Conventional oil and natural gas (excluding CBNG) have been produced in the PRB for more than 100 years, with an estimated 500 fields producing oil or natural gas from oil-bearing strata during that period. Depths to conventional gas and oil-bearing strata generally range from 4,000 and 13,500 feet below grade, though some wells are as shallow as 250 feet.

No conventional oil and gas wells are located in the general analysis area.

Coal Bed Natural Gas

PRB coal bed methane (also known as CBNG) is naturally occurring methane trapped by water pressure in the coal or by impermeable strata above it. In the PRB, this gas is primarily biogenic in origin and is generated by large, subsurface, naturally occurring microbial communities residing in the coal (Ulrich and Bower 2008).

The BLM has completed numerous environmental assessments and three EISs analyzing CBNG projects in Wyoming. The most recent of these analyses is the Final EIS and Proposed Plan Amendment for the PRB Oil and Gas Project, referred to as the Wyoming PRB Oil and Gas EIS (BLM 2003). The EIS covers almost 12,500 square miles, encompasses almost the entire PRB and spans all or parts of Campbell, Converse, Johnson, and Sheridan counties, and covers private, state, and federal lands. It analyzes the standard suite of potential environmental impacts of CBNG development in the PRB, and assumes that approximately 39,400 new CBNG wells would be drilled, completed, and produced over the next 10 years, in addition to the more than 12,000 CBNG wells that had been drilled or were permitted for drilling when the EIS was prepared.

Under favorable geologic conditions, methane can be trapped at shallow depths in and above coal seams; this commonly occurs in the PRB. CBNG has been commercially produced in this region since 1989 when production began at the Rawhide Butte Field, approximately 5 miles southwest of the general analysis area (De Bruin and Lyman 1999). CBNG exploration and development are currently ongoing throughout the PRB. The predominant CBNG production to date in the general analysis area has occurred from the Wyodak-Anderson coal zone, which includes the Anderson and Canyon coal seams at and adjacent to the Buckskin Mine. The Wyodak-Anderson zone appears to be gas-bearing throughout the PRB and, as described above, the methane in the coal beds has been determined to be biogenic in origin. CBNG is also produced from deeper coal beds in the PRB, below the Anderson and Canyon seams.

For CBNG to be collected, the hydrostatic pressure in the coal must be reduced to a level that can vary from seam to seam, which allows the gas to desorb (release) from the coal. This is accomplished by removing water from the coal bed. CBNG reservoirs can be affected by any nearby activities, including coal mining, that reduce the hydrostatic pressure in the coal bed or by the introduction of atmospheric oxygen or other substances which interfere with the metabolic processes of the methane producing bacteria which naturally occur there. The BLM Wyoming State Office–Reservoir Management Group (WSO-RMG) has recently prepared a variety of detailed analyses of CBNG resources in the lands near the existing surface coal mines in the Wyoming PRB for coal leasing and other actions. The WSO-RMG completed a report in 2006 that describes the existing/affected environment of the coal mining areas and adjacent lands with respect to CBNG resources, and documents the observed and inferred resource depletion that has and will continue to occur (WSO-RMG 2006).

WSO-RMG and the USGS have collected coal gas content data from coal cores near the mines and in other areas of the PRB. Measured gas content was minimal in all of the Wyodak-Anderson coal cores collected in 2000 at locations near the surface coal mines, indicating that the coal seams were already substantially depleted of CBNG in the vicinity of the mines at that time. Average total gas content from the core desorption analyses was approximately 6.8 standard cubic feet per ton near the coal mines in 2000, compared with an average measured gas content of 37.6 standard cubic feet per ton from coal cores taken outside the mining areas. Analyses performed by WSO-RMG, USGS, CBNG operators, and others have shown that dewatering of the coal beds, by both CBNG production and mine dewatering, reduces the hydrostatic pressure

in the coals and allows the gas to desorb and escape from the coal, and decreases the anaerobic production of methane. These effects have been ongoing, and it is likely that desorption and decreased production has continued since 2000; as a result, coal gas content and the gas-in-place adjacent to the existing mines would currently be expected to be less than in 2000.

The Wyoming Oil and Gas Conservation Commission (WOGCC) well data from the mining townships generally show that operator interest in the eastern PRB mining areas peaked prior to 2000 and declined rapidly following 2001. Activity had declined to almost negligible levels during 2005 (WSO-RMG 2006).

The Anderson and Canyon seams tapped for CBNG are the same seams that are being mined at Buckskin Mine. CBNG occurs in these seams within the general analysis area and is common in equivalent seams throughout the PRB. WOGCC records indicate that as of May 2008, 30 CBNG wells have been completed in the general analysis area (appendix F). Fifteen wells (13 in the Canyon seam and 2 in the Anderson seam) are producing and 3 wells (2 in the Canyon and 1 in the Anderson) have been shut in and may be reinstated for production in the future. Twelve other wells are no longer producing, have been permanently abandoned, or have expired permits (Wyoming Oil and Gas Conservation Commission 2009). WOGCC records indicate that no CBNG wells have been completed below the Anderson and Canyon seams within the general analysis area.

Manufactured Methane from Coal Beds

A large percentage of the discovered natural gas (methane) reserves are believed to have been generated through the anaerobic microbial process of methanogenisis (Rice and Claypool 1981). Methane gas produced in this manner is often referred to as biogenetic methane. This process uses a group of predominantly anaerobic microorganisms that metabolizes the complex organic molecules in hydrocarbon deposits and produces the methane as a waste product. Biogenic methane has been detected in a wide variety of unconsolidated sediment and rock types around the world, including PRB coals (Law et al. 1991; Rice 1993).

Luca Technologies Inc. has developed a method of enhancing biogenetic methane production from indigenous bacterial communities residing in the PRB coals. The company transforms uneconomically producing CBNG wells and uses the existing infrastructure for its coal conversion and methane production operations, which are handled by their directly owned subsidiary, Patriot Energy Resources. The company has completed a test project near Sheridan, Wyoming, and has begun operations using a mineral nutrient to feed the microbacteria currently residing in the PRB coal seams. These communities are currently capable of producing up to 30 million cubic feet per day when provided nutrients (DeBruyn pers. comm.). Methane produced in this manner has been commercially produced since 2007.

The amount of coal converted through methanogenisis is less than 1% at the current level of technology. The future rate of the technological development and production of methane using microbacteria is unknown at this time but it is expected that, with continued success and public demand for either methane, hydrogen, or other biological metabolic byproducts of the microbial

consortia, such operations could remain in place for the foreseeable future (DeBruyn pers. comm.).

Other Minerals

Bentonite, uranium, and clinker also are commercially produced in the PRB, though to a far lesser degree than the other resources discussed in this section. Layers of bentonite (decomposed volcanic ash) of varying thickness are present throughout the PRB. Some of the thicker layers are mined where they are near the surface, mostly around the edges of the basin. Bentonite has a large capacity to absorb water, making it usable in a number of common processes and products. Bentonite reserves have not been identified in the general analysis area.

Substantial uranium resources are found in southwestern Campbell and northwestern Converse counties. Uranium exploration and mining were quite active in the 1950s, when numerous claims were filed in the PRB. A decreased demand combined with increased foreign supply reduced uranium mining activities in the early 1980s, although staking of mining claims is currently increasing. No known uranium reserves exist in the general analysis area.

Clinker is present in the general analysis area and can be used for construction aggregate as well as a road treatment to provide traction in winter. These clinker resources exist on limited hillsides along the northern portion of the general analysis area.

3.3.2.2. Environmental Consequences

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) would have a moderate to substantial, permanent impact on CBNG resources not recovered prior to mining. This action would have a moderate, short-term impact on access to subcoal conventional oil and gas resources in the proposed tract. The Proposed Action would have no impact on clinker, uranium, and bentonite because they are not present in the proposed tract. Activities in the support area (241 acres) would have no impact on unrecovered CBNG reserves, a minor, short-erm impact on access to sub-coal conventional oil and gas reserves, and no impact on other mineral resources. Impacts in the remainder of the overlap area (474 acres) from mining existing coal leases would be the same as for the support area.

Unrecovered CBNG resources in the overburden, interburden, and coal seam would be lost through venting and/or depletion of hydrostatic pressure during the mining process, but CBNG below the lowest mined coal seam would not be affected. Fifteen producing CBNG wells are present in the general analysis area. Before mining operations could begin, all active CBNG wells would have to be plugged and abandoned, and all gas production equipment would have to be removed. CBNG resources that have not been recovered from the Canyon and Anderson coal seams prior to mining would be lost when the coal is removed. Dewatering wells and active mining would combine with ongoing CBNG production to deplete the hydrostatic pressures and methane resources adjacent to mining areas. Mining would begin shortly after that process is completed. It is also likely that any undrilled spacing units in the proposed tract will have been

drained by production from the existing wells and nearby mining activity prior to initiation of mining. Mining operations within the proposed tract would not begin until permitting is completed, which generally requires several years after a lease is acquired. By that time, it is likely that most of the economically recoverable CBNG resource would have been produced.

No conventional oil and gas wells are present in the proposed tract. Oil and gas (conventional and CBNG) reservoirs located below the mineable Canyon and Anderson coal seams would not be directly disturbed by coal removal. Those resources could be plugged prior to mining. Following mining and reclamation, oil and gas lessees could drill new wells to recover those resources from any productive reservoirs below the lowest mined coal seam. Redeveloping deep oil, gas, and CBNG reservoirs would likely occur only if the lessee believes that the value of the reserves justifies the expense of recompleting or drilling wells.

Alternative 1 (No Action)

Under the No Acton Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) would have no impact on unrecovered CBNG reserves and a minor, short-term impact on access to sub-coal conventional oil and gas reserves. This alternative would have a minor, permanent impact on limited clinker resource, but no impact on uranium or bentonite reserves. As discussed in section 2.2.2, a decision to reject the lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, surface coal mining in the BLM study area (up to 1,883 acres) would have a moderate to substantial, permanent impact on CBNG resources not recovered prior to mining. This action would have a moderate, short-term impact on access to sub-coal conventional oil and gas resources in the proposed tract. Alternative 2 would have a minor, permanent impact on clinker resources, but no impact on uranium or bentonite reserves because they are not present in the BLM study area. Activities in the support area (926 acres) would have no impact on unrecovered CBNG reserves, a minor, short-term impact on access to sub-coal conventional oil and gas reserves, a minor, permanent impact on clinker, and no impact on other mineral resources. Impacts in the remainder of the overlap area (38 acres) from mining existing coal leases would be the same as for the support area.

As for the Proposed Action, gas reserves below the lowest mined coal seam would still be accessible to operators after mining and reclamation have been completed. Mine-related activities in the support area and remainder of the overlap area would affect up to 12.5 acres of the limited clinker reserves.

3.3.2.3. *Regulatory Compliance, Mitigation, and Monitoring*

The potential does exist for conflicts between coal operations and CBNG and conventional oil and gas wells completed, ongoing, or possible in formations and coal beds below the Canyon and Anderson seams.

If the federal coal in the tracts is leased and conflicts do develop between the various industry operators under the action alternatives, several mechanisms are in place that can be used to facilitate recovery of the conventional oil and gas and CBNG resources prior to mining. These mechanisms include:

- The BLM could attach a multiple mineral development stipulation to the federal coal lease, which states that the BLM will not approve operations that would unreasonably interfere with the development and/or production of existing mineral leases issued before the coal lease on the same lands (see appendix E).
- Conventional oil and gas wells could be abandoned during mining and reclamation operations, then be recompleted or redrilled following mining.
- The BLM could offer royalty incentives to CBNG operators to accelerate production, as provided for in the BLM Instruction Memorandum (2003-253), to recover the natural gas while simultaneously allowing uninterrupted coal mining operations. This memorandum also states that it is the policy of the BLM to encourage oil and gas and coal companies to resolve conflicts between themselves; when requested, the BLM will assist in facilitating agreements between the companies.
- Mining the proposed tract or alternative tract configuration cannot occur until the coal lessee has a permit to mine the tract approved by the WDEQ and a Mineral Leasing Act mining plan approved by the Secretary of the Interior. Before the mining plan can be approved, the BLM must approve the Resource Recovery Protection Plan for mining the tract. Prior to approving the plan, the BLM can review the status of CBNG and conventional oil and gas development and the mining sequence proposed by the coal lessee. The permit approval process generally takes the coal lessee several years, during which time CBNG resources can be recovered.
- Prior to mining the federal coal reserves, Kiewit could negotiate an agreement with owners and operators of existing oil and gas and pipeline facilities, regarding removal and relocation of their infrastructure.

Clinker is often removed during mining because its use in construction is deemed viable enough to segregate it from other overburden materials. It may be feasible to recover clinker from the overburden in some areas as part of the overburden removal process. Clinker not disturbed by mining under the action alternatives could also be removed after mining.

3.3.2.4. *Residual Impacts*

Clinker deposits excavated for construction or other uses would be permanently removed. CBNG resources not recovered before mining would be vented to the atmosphere and permanently lost. Oil and gas resources (conventional and CBNG) below the lowest coal seam to be mined could be recovered when mine operations are completed.

3.3.3. Paleontology

3.3.3.1. *Affected Environment*

Two formations exposed on the surface of the proposed tract could contain paleontological resources: the Paleocene Fort Union Formation and the Paleocene and Eocene Wasatch Formation (Breckenridge 1974; Love and Christiansen 1985). Both of these sedimentary formations are known to yield vertebrate fossils in Wyoming (Estes 1975; Roehler 1991; Secord 1998; Robinson et al. 2004).

The BLM's Potential Fossil Yield Classification system ranks geologic formations based on their potential to yield significant paleontological resources. The five main classes in the system are:

- class 1 – very low
- class 2 – low
- class 3 – moderate or unknown
- class 4 – high
- class 5 – very high

Additional subcategories have been identified within some classes. Under this classification system, the Fort Union Formation in the PRB is considered to be class 4 and the Wasatch Formation in that region is a class 3a (Hanson pers. comm.). A more detailed description of the two classifications for the Fort Union and Wasatch formations is provided below.

Class 3—Moderate or Unknown. Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence; or sedimentary units of unknown fossil potential.

- terrestrial (continental) in origin with sporadic known occurrences of vertebrate fossils;
- vertebrate fossils and scientifically significant invertebrate or plant fossils known to occur intermittently, predictability known to be low; or
- poorly studied and/or poorly documented; potential yield cannot be assigned without ground reconnaissance.

Class 3a—Moderate Potential. Units are known to contain vertebrate fossils or scientifically significant non-vertebrate fossils, but these occurrences are widely scattered. Common invertebrate or plant fossils may be found in the area, and opportunities may exist for hobby collecting. The potential for a project to be sited on or impact a significant fossil is low but is somewhat higher for common fossils.

Class 4—High. Geologic units containing a high occurrence of significant fossils. Vertebrate fossils or scientifically significant invertebrate or plant fossils are known to occur and have been documented but may vary in occurrence and predictability. Surface-disturbing activities may adversely affect paleontological resources in many cases.

Class 4a—Unit is exposed with little or no soil or vegetative cover. Outcrop areas are extensive with exposed bedrock areas often larger than 2 acres. Paleontological resources may be susceptible to adverse impacts from surface-disturbing actions. Illegal collecting activities may impact some areas.

Class 4b—Areas underlain by geologic units with high potential but have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation due to moderating circumstances. The bedrock unit has high potential, but a protective layer of soil, thin alluvial material, or other conditions may lessen or prevent potential impacts on the bedrock resulting from the activity.

- Extensive soil or vegetative cover; bedrock exposures are limited or not expected to be impacted.
- Areas of exposed outcrop are smaller than 2 contiguous acres.
- Outcrops form cliffs of sufficient height and slope so that impacts are minimized by topographic conditions.
- Other characteristics are present that lower the vulnerability of both known and unidentified paleontological resources (BLM 2007b).

As a result of the 2007 paleontological survey findings (described below), the classifications for the Fort Union and Wasatch formations in the PRB have changed. The Fort Union Formation was upgraded from a class 3 to a class 4 statewide average and the Wasatch Formation in the PRB was downgraded to class 3a, although outside the PRB the Wasatch is a class 5 statewide (Hanson pers. comm.).

Fossils other than vertebrates that occur in the Fort Union Formation include gastropods (limpets, snails and slugs), bivalves (oysters, mussels, and clams) and plant fossils. Fossils that occur in the Wasatch Formation include mammals, birds, fish, and reptiles (Jones & Stokes 2007).

A pedestrian reconnaissance survey for fossils was conducted in November 2007 for the general analysis area. All outcrops were closely inspected, including bare, sparsely vegetated, or thin soil areas; stream and drainage bank exposures; large colluvium, lag areas, and colluvium near outcrops. Several fossil types were found during the survey in four locations. None of the four localities was within the proposed tract. One locality was just within the northeastern tip of the BLM study area, and the remaining three were along the northern tier of the general analysis area. Fossils found in the Fort Union Formation include: crocodilian scutes (boney external plates or scales); a short segment of a limb bone from a large mammal; a small unidentifiable bone fragment (possibly crocodile); gastropod shell fragments; and small, highly weathered, and

fossilized wood fragments. Invertebrate trace fossils and small root traces were found in the Wasatch Formation.

No significant or unique paleontological resources or localities have been recorded within the general analysis area, including those found during field surveys for this EIS. While the occurrences of crocodilian scutes, the limb bone, and small bone fragments are notable because they are the only vertebrate fossils currently known to have been found in the PRB Fort Union Formation, they are not considered to be of high scientific value because they were solitary finds, and no sign of other vertebrate fossils was observed in the immediate area. In addition, the mammalian species to which the limb bone segment belongs could not be determined: neither the taxon nor element represented by the bone fragment could be identified (Jones & Stokes 2007). While these findings indicate other vertebrate fossils could be found in the general analysis area, the likelihood of such a find would be minimal.

Based on these survey results, no specific mitigation was recommended by the paleontologist in the field report and no further paleontological work was recommended or required by the BLM regional paleontologist.

3.3.3.2. *Environmental Consequences*

Proposed Action

Under the Proposed Action, surface coal mining and related activities would have no impact on significant or unique paleontological resources on the surface of the proposed tract (419 acres) or in the support area (241 acres). This action could have a moderate to substantial, permanent impact on paleontological resources beneath the surface of these areas, assuming such resources are present. Activities in the remainder of the overlap area (474 acres) associated with mining existing coal leases would have no impact on significant or unique paleontological resources on the surface, but could have a moderate to substantial, permanent impact on such resources beneath the surface. No significant fossils were found in the outcrops of the Fort Union and Wasatch formations exposed on the surface of the proposed tract; however, fossils with scientific significance could be present but not exposed at the surface.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) associated with mining existing coal leases would have no impact on significant or unique paleontological resources on the surface. However, such activities could have a moderate to substantial, permanent impact on paleontological resources beneath the surface of that area, assuming such resources are present. As discussed in section 2.2.2, a decision to reject the lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, mining and related activities would have no impact on significant or unique paleontological resources on the surface of the BLM study area (up to 1,883 acres) or support area (926 acres). Those activities could have a moderate to substantial, permanent impact on paleontological resources beneath the surface, assuming such resources are present. Activities in the remainder of the overlap area (38 acres) associated with mining existing coal leases would have the same impacts on paleontological resources located on and beneath the surface as in the support area.

3.3.3.3. *Regulatory Compliance, Mitigation, and Monitoring*

If a tract is leased under one of the action alternatives, the BLM will attach a stipulation (appendix E) to the lease requiring the operator to report significant paleontological finds to the authorized federal agency and suspend production in the vicinity of the find until an approved paleontologist can evaluate the paleontological resource.

3.3.3.4. *Residual Impacts*

Paleontological resources not identified and removed prior to or during mining operations would be permanently lost. No such incidents have occurred within the existing Buckskin Mine lease, or elsewhere in the PRB coal region.

3.4. Air Quality

This section summarizes the affected environment in the general analysis area and the potential air quality impacts of the Proposed Action and alternatives. Appendix G provides background information on the air quality regulatory framework, regional conditions, modeling efforts, and the best available control technology (BACT) process. That appendix also provides the history of monitoring for particulate matter in the PRB. The information presented in this section and in appendix G is based on data provided by the Buckskin, Eagle Butte, Rawhide, Dry Fork, and Wyodak mines and from various state and federal sources. Existing and projected cumulative air quality impacts are discussed in chapter 4.

3.4.1. Background

3.4.1.1. *Air Quality Determinants*

The air quality of any region is controlled primarily by the magnitude and distribution of pollutant emissions and the regional climate. The transport of pollutants from specific source areas is strongly affected by local topography, winds (speed and direction), and precipitation. In the mountainous region of the western United States, topography is particularly important in channeling pollutants along valleys, creating upslope and downslope circulations that may entrain airborne pollutants, and blocking the flow of pollutants toward certain areas. Local

effects, however, are commonly superimposed on the general widespread weather regime and are only important during those periods when the large-scale wind flow is weak.

Wyoming can be characterized as having a combination of both highland and mid-latitude semiarid climates. The dominant factors that affect the climate of the area are elevation, local relief, and the mountain barrier effect. This barrier effect can produce marked temperature and precipitation differences between windward and leeward slopes. Generally, temperatures decrease and precipitation increases with increasing elevation. Section 3.1.1 contains additional information about the meteorology and climate in the general analysis area.

The general analysis area (map 3.0-1) is located in the northern portion of the PRB. The topography is primarily rolling plains and tablelands of moderate relief with occasional valleys and buttes. Elevations range from about 4,080 to 4,380 feet above mean sea level. The Big Horn Mountains lie approximately 60 miles to the west and the Black Hills lie approximately 60 miles to the east.

3.4.1.2. *Applicable Air Quality Standards and Regulations*

The CAA requires the EPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health and welfare. These standards define the maximum level of air pollution allowed in the ambient air. The CAA established NAAQS for six pollutants, known as "criteria" pollutants, which "... cause or contribute to air pollution which may be reasonably anticipated to endanger public health or welfare and the presence of which in the ambient air results from numerous or diverse mobile or stationary sources." The six present-day criteria pollutants are lead, nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), ozone, and particulate matter (PM_{10} and $PM_{2.5}$), where PM_{10} is coarse particulate with mean aerodynamic diameters less than 10 microns and $PM_{2.5}$ is fine particulate with a diameter of 2.5 microns or less. Both particle sizes are small enough to penetrate into the lungs; $PM_{2.5}$ in particular can cause serious health problems.

Air quality regulations applicable to surface coal mining include the NAAQS, Wyoming Ambient Air Quality Standards (WAAQS), prevention of significant deterioration (PSD), new source performance standards, and the Federal Operating Permit Program (Title V). These regulatory programs are described in appendix G. Air pollution impacts are limited by local, state, tribal, and federal air quality regulations and standards, and state implementation plans (SIPs) established under the CAA and the CAA Amendments of 1990. In Wyoming, air pollution impacts are managed by the WDEQ under the Wyoming Air Quality Standards and Regulations and the EPA-approved SIP. A memorandum of agreement dated January 24, 1994, between EPA and the State of Wyoming allows the WDEQ to use particulate monitoring in lieu of short-term modeling to assess 24-hour compliance and to predict short-term ambient impacts from mining. Annual impacts are predicted using the industrial source complex long-term model, version 3 (ISC3LT). Appendix G contains a more detailed discussion of compliance and BACT demonstration.

3.4.1.3. Emissions Sources in the General Analysis Area

Air quality conditions in rural areas are typically better than in large, urban, or heavily industrialized areas. The northern PRB is a semi-industrial area containing six surface coal mines, multiple power plants, numerous natural gas wells and conventional oil and gas wells, and supporting rail and road infrastructure. Occasional high concentrations of CO, ozone, and particulate matter may occur in this region as well as in the urban areas of Gillette, Sheridan, and Buffalo, especially under stable atmospheric conditions that occur during winter.

The major types of emissions that come from surface coal mining activities are in the form of fugitive dust and tailpipe emissions from large mining equipment. Activities such as blasting, excavating, loading and hauling overburden and coal, and the large areas of disturbed land produce fugitive dust. Stationary or point sources are associated with coal crushing, storage, and handling facilities. In general, PM_{10} particulate matter is the major pollutant from coal mine point and fugitive sources. Emissions of nitrogen oxides (NO_x) from blasting and mining equipment exhaust can also be present, particularly at the larger surface mines in the southern PRB.

As discussed in appendix G, NO_2 is a product of incomplete combustion at sources such as gasoline- and diesel-burning engines or from mine blasting activities. Generally, blasting-related NO_x emissions are more prevalent at operations that use the technique referred to as cast blasting (Chancellor pers. comm.). This describes a type of direct blasting in which the explosion is designed to cast the overburden from on top of the coal into the previously mined area. The Buckskin mine does not use this technique and does not anticipate doing so in the future. The higher strip ratios (ratio of overburden to coal) at Buckskin do not lend themselves to dragline excavation, with which cast blasting is commonly associated.

Concentrations of the six criteria pollutants in the PRB and applicable standards are shown in table 3.4-1.

Non-mining air pollutant emission sources in the region include:

- emissions exhaust (primarily CO and NO_x) from existing natural-gas-fired compressor engines used in production of natural gas and CBNG;
- gasoline and diesel vehicle tailpipe emissions of combustion pollutants, volatile organic compounds, carbon dioxide (CO_2), NO_x, PM_{10} particulate matter, $PM_{2.5}$ particulate matter, and SO_2;
- dust (particulate matter) generated by vehicle travel on unpaved graded roads, windblown dust from neighboring areas, agricultural activities such as plowing, and paved road sanding during the winter months;
- transport of air pollutants from emission sources located outside the region;
- emissions from railroad locomotives used to haul coal (primarily NO_2 and PM_{10}); and
- SO_2 and NO_x from power plants.

Table 3.4-1. Assumed Background Air Pollutant Concentrations, Applicable AAQS, and PSD Increment Values (in µg/m³)

Criteria Pollutant	Averaging Time[a]	Background Concentration	Primary NAAQS[b]	Secondary NAAQS[b]	WAAQS	PSD Class I Increments[c]	PSD Class II Increments[c]
Carbon monoxide	1-hour	3,336[d]	40,000	40,000	40,000	—	—
	8-hour	1,381	10,000	10,000	10,000	—	—
Nitrogen dioxide	Annual	5[e]	100	100	100	2.5	25
	1-hour	16[e]	187	—	—	—	—
Ozone	8-hour	134[f]	147	147	147	—	—
Sulfur dioxide	1-hour	162[g]	200	—	—	—	—
	3-hour	181[g]	—	1,300	1,300	25	512
	24-hour	62[g]	365	—	260	5	91
	Annual	13[g]	80	—	60	2	20
PM_{10}[h]	24-hour	54[i]	150	150	150	8	30
	Annual	13[i]	—	—	50	4	17
$PM_{2.5}$[h]	24-hour	13[j]	35	35	65	—	—
	Annual	4[j]	15	15	15	—	—

µg/m³ = micrograms per cubic meter; NAAQS = National Ambient Air Quality Standards; WAAQS = Wyoming Ambient Air Quality Standards

[a] Annual standards are not to be exceeded; short-term standards are not to be exceeded more than once per year.

[b] Primary standards are designed to protect public health; secondary standards are designed to protect public welfare.

[c] All NEPA analysis comparisons to the PSD increments are intended to evaluate a threshold of concern and do not represent a regulatory PSD Increment Consumption Analysis.

[d] Data collected by Amoco at Ryckman Creek for an eight-month period during 1978-1979, summarized in Riley Ridge EIS (BLM 1983).

[e] Data collected at Thunder Basin National Grassland, Campbell County, Wyoming in 2002.

[f] Data collected at Thunder Basin National Grassland, Campbell County, Wyoming in 2005-2009 (fourth highest daily 8-hour high).

[g] Data collected by Black Hills Power & Light at Wygen 2, Campbell County, Wyoming in 2002.

[h] On October 17, 2006, EPA published final revisions to the NAAQS for particulate matter that took effect on December 18, 2006. The revision strengthens the 24-hour $PM_{2.5}$ standard from 65 to 35 µg/m³ and revokes the annual PM_{10} standard of 50 µg/m³. The State of Wyoming will enter into rulemaking to revise the WAAQS.

[i] Data collected at the Eagle Butte Mine, Campbell County, Wyoming in 2002.

[j] Data collected at the Buckskin Mine in 2002.

Source: Task 1A Report (BLM 2005c); EPA AQS Database (2002a and b, 2005a, 2006a, 2007a, 2008a, 2009a).

3.4.2. Particulate Emissions

3.4.2.1. *Affected Environment*

Particulates include solid particles and liquid droplets that can be suspended in air. Particulates, especially fine particulates such as $PM_{2.5}$, have been linked to numerous respiratory related illnesses and can adversely affect individuals with pre-existing heart or lung diseases. They are also a major cause of visibility impairment in many parts of the United States. While individual particles cannot be seen with the naked eye, collectively they can appear as black soot, dust clouds, or gray hazes.

The current (since December 2006) EPA 24-hour air quality standard for $PM_{2.5}$ is 35 micrograms per cubic meter ($\mu g/m^3$), a reduction from the previous level of 65 $\mu g/m^3$. The current annual $PM_{2.5}$ standard is 15 $\mu g/m^3$. The current 24-hour standard for PM_{10} particulates is 150 $\mu g/m^3$. The annual PM_{10} standard of 50 $\mu g/m^3$ was revoked during the EPA revisions of air quality standards in 2006. In view of the December 2006 revisions to the NAAQS for particulate matter, the State of Wyoming entered into rulemaking to revise the WAAQS for particulate matter so that they remain as stringent as or more stringent than the NAAQS. Current federal ambient air standards for all six criteria pollutants are shown in table 3.4-1, including those for current PM_{10} and $PM_{2.5}$ standards in Wyoming. Additional information on the history of this process is provided in appendix G.

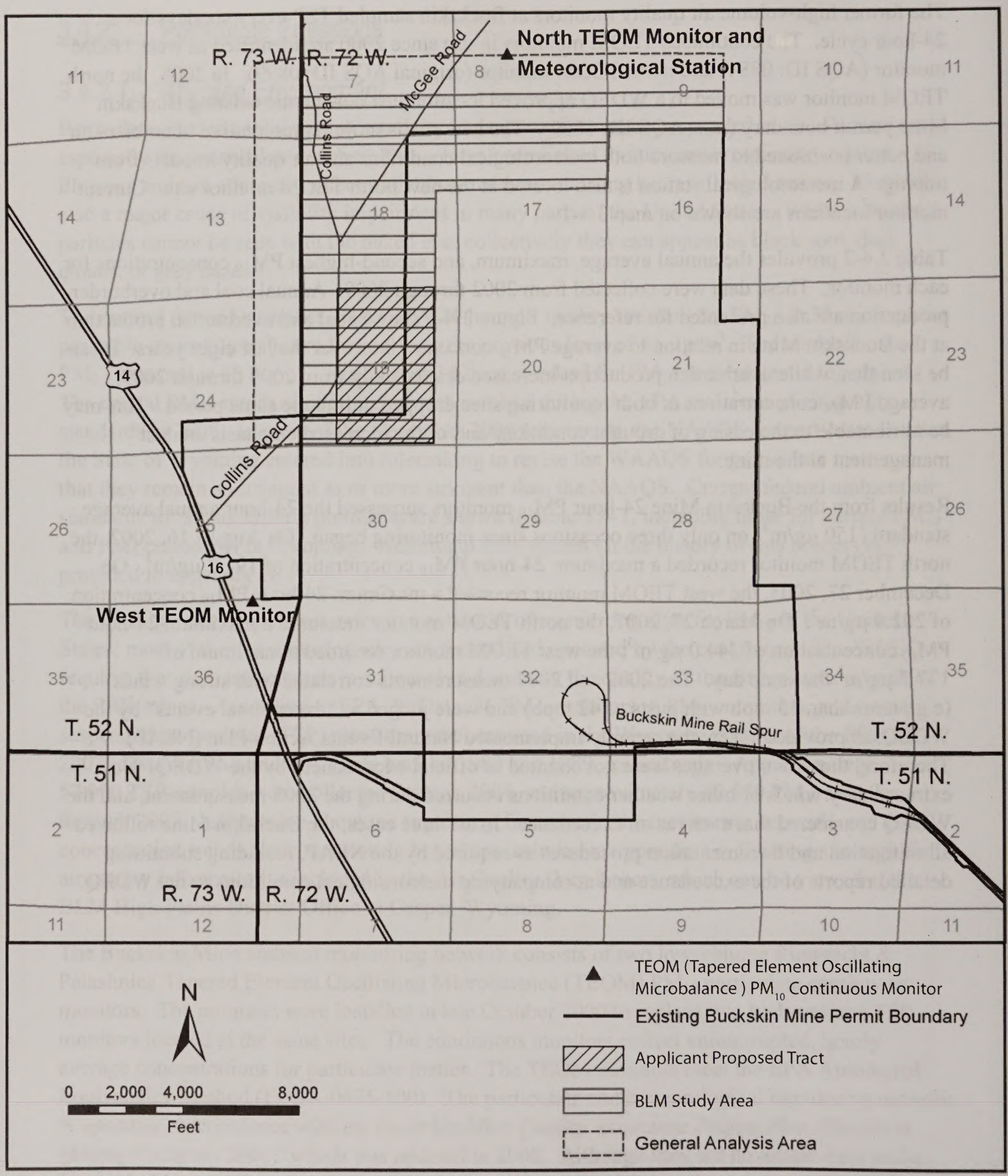
The PRB has one of the most extensive networks of monitoring sites for PM_{10} in the United States; most of these monitoring sites are funded and operated by the coal mines. The WDEQ requires that such information is collected to document the quality of the air resource at each of the PRB mines. According to EPA AirData, 36 PM_{10} monitors, 6 $PM_{2.5}$ monitors, and 6 total suspended particulates (TSP) monitors were stationed in the Wyoming portion of the PRB in 2007. Data for TSP and PM_{10} date back to 1980 and 1989, respectively. Approximately 57,000 TSP samples were collected through 2004, and approximately 47,550 PM_{10} samples through 2007. Information about the regulatory framework, the monitoring network, and PM_{10} concentration trends since monitoring began are included in appendix G. Existing site-specific air quality information is included in the Air Quality Data Report, which can be viewed at the BLM High Plains District Office in Casper, Wyoming.

The Buckskin Mine ambient monitoring network consists of two low-volume Rupprecht & Patashnick Tapered Element Oscillating Microbalance (TEOM) PM_{10} particulate continuous monitors. The monitors were installed in late October 2000 to replace two high-volume TSP monitors located at the same sites. The continuous monitors collect uninterrupted, hourly average concentrations for particulate matter. The TEOM monitors meet the EPA Automated Equivalency Method (EQSA-0495-100). The particulate and meteorological monitoring network is operated in accordance with the *Buckskin Mine Quality Assurance Project Plan* (Buckskin Mining Company 2001), which was updated in 2008. Although they are no longer used at the Buckskin Mine, TSP monitoring is still conducted in some PRB locations, in part to serve as an indication of overall atmospheric levels of particulate matter.

The former high-volume air quality monitors at Buckskin sampled TSP every six days for a 24-hour cycle. The continuous TEOM monitors in use since 2000 are identified as west TEOM monitor (AQS ID: 0884) and north TEOM monitor (original AQS ID: 0899). In 2008, the north TEOM monitor was moved to a WDEQ approved location just outside the existing Buckskin Mine permit boundary (new AQS ID: 1899). The new site is more representative of ambient air and better positioned to measure both meteorological conditions and air quality impacts from mining. A meteorological station is also located at the new north TEOM monitor site. Current monitor locations are shown on map 3.4-1.

Table 3.4-2 provides the annual average, maximum, and second-highest PM_{10} concentrations for each monitor. These data were collected from 2002 through 2009. Annual coal and overburden production are also presented for reference. Figure 3.4-1 shows coal and overburden production at the Buckskin Mine in relation to average PM_{10} concentrations over the last eight years. It can be seen that, while overburden production increased dramatically from 2007 through 2009, average PM_{10} concentrations at both monitoring sites dropped during the same period. This may be attributable to the easing of drought conditions and/or the increased emphasis on dust management at the mine.

Results from the Buckskin Mine 24-hour PM_{10} monitors surpassed the 24-hour annual average standard (150 $\mu g/m^3$) on only three occasions since monitoring began. On August 16, 2002, the north TEOM monitor recorded a maximum 24-hour PM_{10} concentration of 191.7 $\mu g/m^3$. On December 27, 2003, the west TEOM monitor recorded a maximum 24-hour PM_{10} concentration of 202.4 $\mu g/m^3$. On March 27, 2007, the north TEOM monitor measured a maximum 24-hour PM_{10} concentration of 244.0 $\mu g/m^3$; the west TEOM monitor recorded a maximum of 177.7 $\mu g/m^3$ the same day. The 2002 and 2007 measurements correlated with strong winds (e.g., more than 33 mph with gusts of 42 mph) and were judged as "exceptional events" by the WDEQ, as provided for by the recently implemented Natural Events Action Plan (NEAP). Therefore, those two overages were not counted as official exceedances by the WDEQ. No extraordinary winds or other weather conditions occurred during the 2003 measurement, and the WDEQ considered that event as an exceedance. In all three cases, the Buckskin Mine followed all mitigation and documentation procedures as required by the NEAP, including submitting detailed reports of the exceedance and accompanying meteorological conditions to the WDEQ.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 3.4-1

Buckskin Mine Ambient Air Monitoring Network

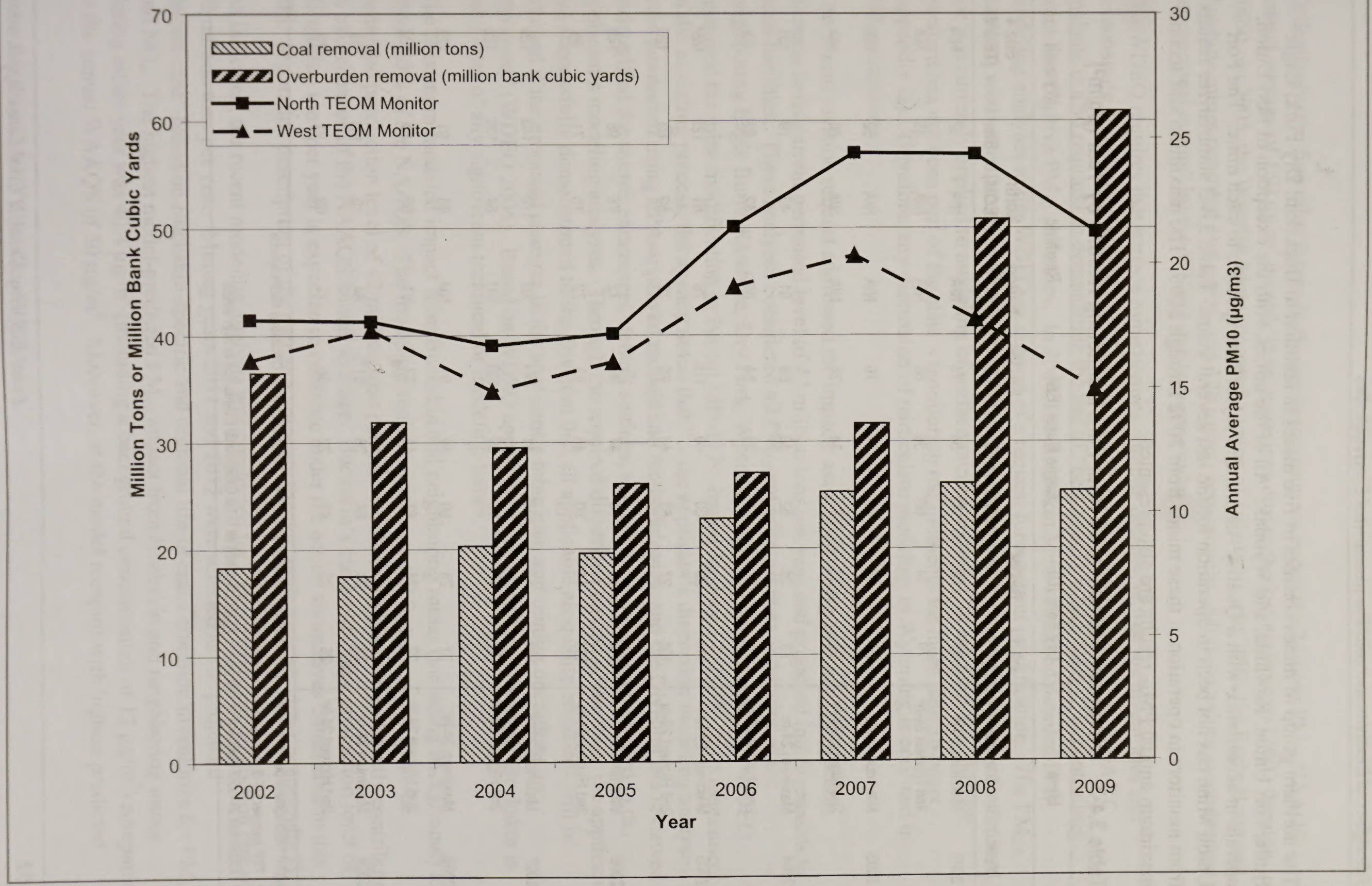
Table 3.4-2. Buckskin Mine Annual PM_{10} Monitoring Results and Production ($\mu g/m^3$)

Year	Quarter	North Average	North High	North 2nd High	West Average	West High	West 2nd High	MM Tons Coal	MM BCY Overburden
2002	1	14.9	37.5	34.1	12.9	34.9	30.9		
	2	20.0	95.7	73.4	18.3	60.9	43.4		
	3	25.1	181.7	71.0	21.9	70.5	57.9		
	4	11.1	29.3	22.6	11.5	25.7	23.3		
	Annual	17.8	181.7	95.7	16.2	70.5	60.9	18.3	36.5
2003	1	10.9	35.1	29.8	10.7	49.7	23.4		
	2	15.6	56.3	42.7	14.2	41.3	39.2		
	3	29.2	77.6	76.9	26.5	80.1	63.0		
	4	15.1	47.6	40.3	18.0	202.4	139.1		
	Annual	17.7	77.6	76.9	17.4	202.4	139.1	17.5	31.9
2004	1	14.5	53.7	47.5	13.4	47.3	41.4		
	2	18.7	116.3	41.1	16.8	74.9	33.3		
	3	20.1	42.3	40.2	17.7	38.5	33.7		
	4	13.6	40.1	33.8	11.7	27.7	25.6		
	Annual	16.7	116.3	53.7	14.9	74.9	47.3	20.3	29.5
2005	1	14.0	78.5	47.0	12.7	48.5	30.9		
	2	16.4	68.8	58.7	14.9	48.5	46.6		
	3	25.3	60.0	51.6	24.4	61.1	53.8		
	4	13.1	42.2	41.3	12.3	57.1	32.8		
	Annual	17.2	78.5	68.8	16.1	61.1	57.1	19.6	26.1

Table 3.4-2. Continued

Year	Quarter	North Average	North High	North 2nd High	West Average	West High	West 2nd High	MM Tons Coal	MM BCY Overburden
2006	1	13.1	41.9	38.3	14.7	54.1	47.2		
	2	21.7	72.1	60.7	19.0	58.6	49.6		
	3	34.2	101.4	84.7	28.5	63.7	58.5		
	4	16.9	63.6	58.2	14.1	39.0	34.5		
	Annual	21.5	101.4	84.7	19.1	63.7	58.6	22.8	27.1
2007	1	18.9	244.0	59.9	17.0	177.7	62.9		
	2	20.2	102.5	59.0	19.6	75.3	54.5		
	3	40.2	107.3	84.6	31.1	72.5	68.9		
	4	18.4	75.6	65.9	13.6	53.7	42.8		
	Annual	24.4	244.0	107.3	20.3	177.7	75.3	25.3	31.7
2008	1	14.9	81.0	66.5	13.3	58.8	47.4		
	2	17.7	53.0	46.9	15.8	46.1	28.6		
	3	38.6	96.6	82.2	25.8	60.1	50.8		
	4	26.3	91.7	78.7	16.2	77.5	55.7		
	Annual	24.4	96.6	91.7	17.8	77.5	60.1	26.1	50.8
2009	1	18.8	70.3	66.3	10.7	37.0	28.2		
	2	19.2	67.5	62.4	13.4	30.6	30.1		
	3	28.6	102.2	81.2	23.0	50.6	45.5		
	4	18.5	61.3	58.3	12.7	65.9	57.5		
	Annual	21.3	102.2	81.2	15.0	65.9	57.5	25.4	60.9

MM tons = million tons; MM BCY= million bank cubic yards



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Figure 3.4-1
Buckskin PM_{10} Monitoring History

The northern group of mines consists of five mines in addition to Buckskin: Dry Fork, Eagle Butte, Fort Union, Rawhide, and Wyodak. All of the mines, with the exception of Fort Union, operate in accordance with a Quality Assurance Project Plan specific to each mine. The Fort Union Mine has not been in operation for the last several years. Table 3.4-3 summarizes results from monitors in operation at these mines from 2002 through 2009. The maximum and second maximum annual PM_{10} results are also presented.

Table 3.4-3. Northern PRB Mines: 24-Hour PM_{10} Monitoring Results by Year (µg/m³)

Mine		Dry Fork (DF)		Eagle Butte (EB)			Rawhide		Wyodak	
Year	Sampler	DF-1 / DF-2[a]	DF-3N & 3M	EB-2	EB-5	EB-3N & 3S	Hilltop (TEOM)	North (TEOM)	Site 1	Site 4 (TEOM)
2002	Maximum 24-hr	85	49	143	54	74	N/A	N/A	52	N/A
	2nd Highest 24-hr	79	34	66	36	66	N/A	N/A	48	N/A
2003	Maximum 24-hr	96	45	65	47	76	N/A	N/A	52	N/A
	2nd Highest 24-hr	95	33	61	34	76	N/A	N/A	50	N/A
2004	Maximum 24-hr	73	25	62	40	66	61	43	79	131
	2nd Highest 24-hr	70	24	61	33	64	39	42	62	92
2005	Maximum 24-hr	113	29	60	49	115	76	61	129	165[b]
	2nd Highest 24-hr	107	27	53	48	85	70	59	69	126
2006	Maximum 24-hr	112	68	73	47	99	72	78	96	143
	2nd Highest 24-hr	103	44	60	46	93	72	75	71	95
2007	Maximum 24-hr	109	44	168[b]	41	144	107	178[b]	143	129
	2nd Highest 24-hr	101	40	65	39	139	101	84	100	122
2008	Maximum 24-hr	31	28	60	49	91	104	66	91	123
	2nd Highest 24-hr	27	28	67	41	82	91	65	83	103
2009	Maximum 24-hr	28	24	64	26	61	84	10	101	96
	2nd Highest 24-hr	26	23	49	22	58	72	69	91	72

µg/m³ = micrograms per cubic meter; N/A = Sampler not installed; TEOM = Tapered Element Oscillating Microbalance

[a] TSP sampler DF-2 replaced PM_{10} sampler DF-1 in 2008.

[b] Exceeded 24-hour standard of 150 µg/m³; WDEQ deemed all to be Exceptional Events due to high winds.

Collectively, the five other mines in the northern group exceeded the 24-hour PM_{10} NAAQS annual average of 150 $\mu g/m^3$ on only three occasions during the last eight years (2002 through 2009). In 2005, the Wyodak Mine recorded a value of 165 $\mu g/m^3$. In 2007, the Eagle Butte and Rawhide mines recorded 168 $\mu g/m^3$ and 178 $\mu g/m^3$, respectively. All three values were deemed "exceptional events" by the WDEQ due to high winds.

The WDEQ requires that surface mine permits compile detailed emissions inventories and demonstrate compliance with NAAQS before permit amendments are granted. A BACT analysis is also required to demonstrate the use of "best available technology" in controlling point and fugitive PM_{10} emissions. In 2006, the Buckskin Mine submitted detailed PM_{10} modeling analyses to the WDEQ in support of a request for a permit modification. The $PM_{2.5}$ standard was not enforced by Wyoming when this permit amendment application was submitted, nor is it currently applied to modeling of surface mine emissions. In addition, the old TSP standard has not been part of the state's monitoring requirements for more than 10 years (appendix G). Therefore, any discussion of particulate modeling in Wyoming is confined to PM_{10} emissions.

The permit revision request addressed the impacts associated with a proposed production increase to its current permitted level of 42 million tons per year and proposed improvements to mine facilities. These analyses considered all PM_{10} emission sources and included the neighboring Eagle Butte, Rawhide, Dry Fork, Wyodak, and Fort Union mines. The WDEQ approved the mine modification in Permit MD-1379, issued January 17, 2007. In its assessment of the modeling process, the agency noted that "…the applicant's dispersion modeling analyses were conducted using EPA-approved models and methodologies, and the Division has reviewed and verified the source parameters, default settings, and related modeling inputs used in the applicant's modeling analyses. Through the required dispersion modeling analyses, the applicant has successfully demonstrated to the Division that all applicable air quality standards will be attained if the proposed changes in the applicant's mine plan and mining operations are approved" (WDEQ 2006). Based on WDEQ approval of this permit modification, Buckskin is not aware of any significant technical or modeling issues.

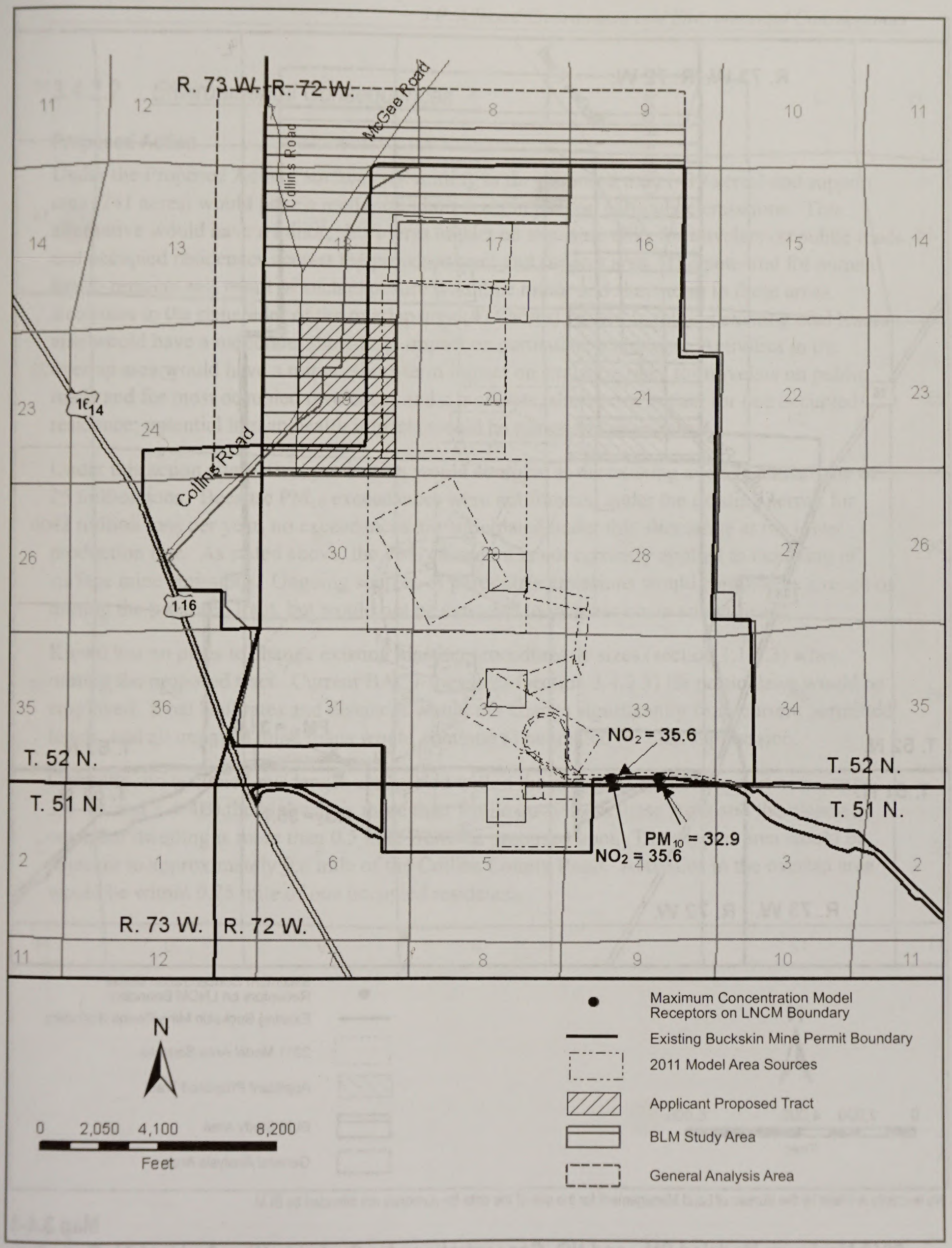
The maximum modeled impact from Buckskin and neighboring mines (including background) is about 80% of the NAAQS. The modeling analysis demonstrated that emissions from the permitted production level of 42 million tons per year would not cause or significantly contribute to exceedances of the NAAQS annual average. Buckskin's current average production level of 25 million tons per year is expected to continue under the action alternatives considered in this EIS. A detailed description of the modeling process for this analysis is provided in appendix G.

As indicated, the recent modeling analysis was conducted for a maximum coal production rate of 42 million tons per year. Mining years 2011 and 2012 were selected as the projected "worst-case" based on Buckskin-specific and regional life-of-mine emission inventories for PM_{10} and NO_x. The highest model-predicted PM_{10} impact from Buckskin and neighboring mines during either year was 40.4 $\mu g/m^3$ (including a background concentration of 12 $\mu g/m^3$) compared to the annual WAAQS of 50 $\mu g/m^3$. Moreover, at the model receptor with highest predicted

cumulative impact, Buckskin's contribution was less than 1 $\mu g/m^3$. The maximum predicted contribution from Buckskin at any receptor was 16 $\mu g/m^3$. Given that the highest prediction for either worst-case year falls below the annual PM_{10} WAAQS, that standard is expected to be met throughout the life of the mine. Map 3.4-2 shows the modeled PM_{10} and NO_2 impacts at receptors located along the permitted Buckskin Mine boundary for 2011. Map 3.4-3 shows the same parameters for 2012. Both maps also depict the area sources used to model fugitive emissions.

In addition to these modeling analyses, the Buckskin Mine also prepared a demonstration of short-term compliance with the 24-hour PM_{10} standard based on results from a single monitoring cycle as part of the 2006 air quality permit modification request. According to WDEQ policy (appendix G), a modeling analysis for short-term data was not required or conducted because the model tends to significantly over-predict 24-hour impacts of surface coal mines, and the agency therefore considers it to be an inaccurate representation of those impacts. Instead, the short-term compliance analysis focused on historical monitoring data and continuing employment of BACT on mine-wide emissions. That analysis again concluded that the 24-hour PM_{10} WAAQS would be protected throughout the life of the mine.

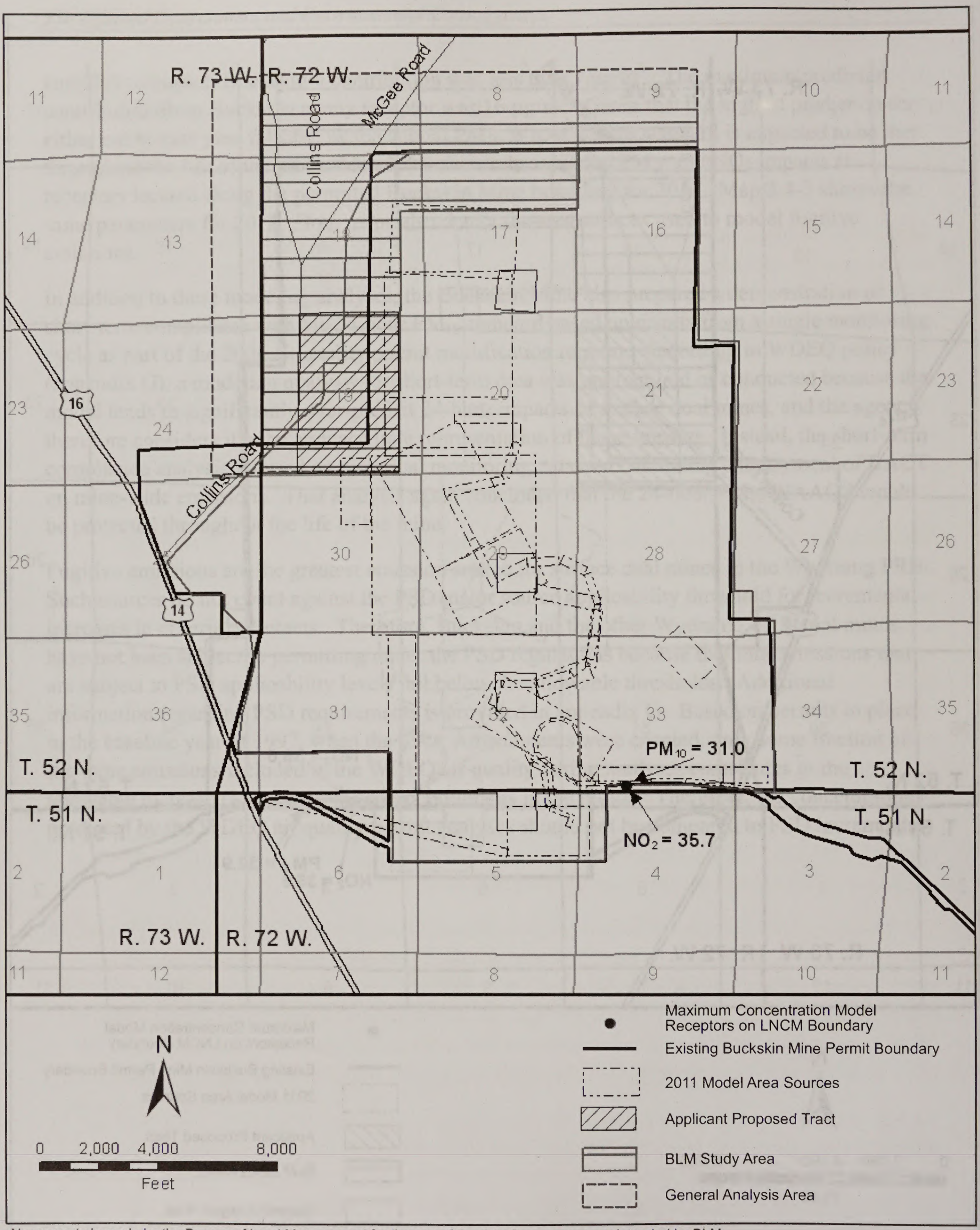
Fugitive emissions are the greatest emission source for surface coal mines in the Wyoming PRB. Such sources do not count against the PSD major source applicability threshold for incremental increases in criteria pollutants. Therefore, Buckskin and the other Wyoming PRB coal mines have not been subject to permitting under the PSD regulations because the mine emissions that are subject to PSD applicability levels fall below the allowable thresholds. Additional information regarding PSD requirements is provided in appendix G. Based on permits in place in the baseline year of 1997, when the CAA Amendments were enacted, only some fraction of the mine emissions included in the WDEQ air quality permit analyses contributes to the allowable increase (increment) in criteria pollutants in the region. Therefore, the concentrations predicted by the WDEQ air quality permit analyses should not be compared to PSD increments.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 3.4-2

2011 Maximum Modeled PM_{10} and NO_2 Concentrations for Buckskin Mine Ambient Air Boundary



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 3.4-3

2012 Maximum Modeled PM_{10} and NO_2 Concentrations for Buckskin Mine Ambient Air Boundary

3.4.2.2. Environmental Consequences

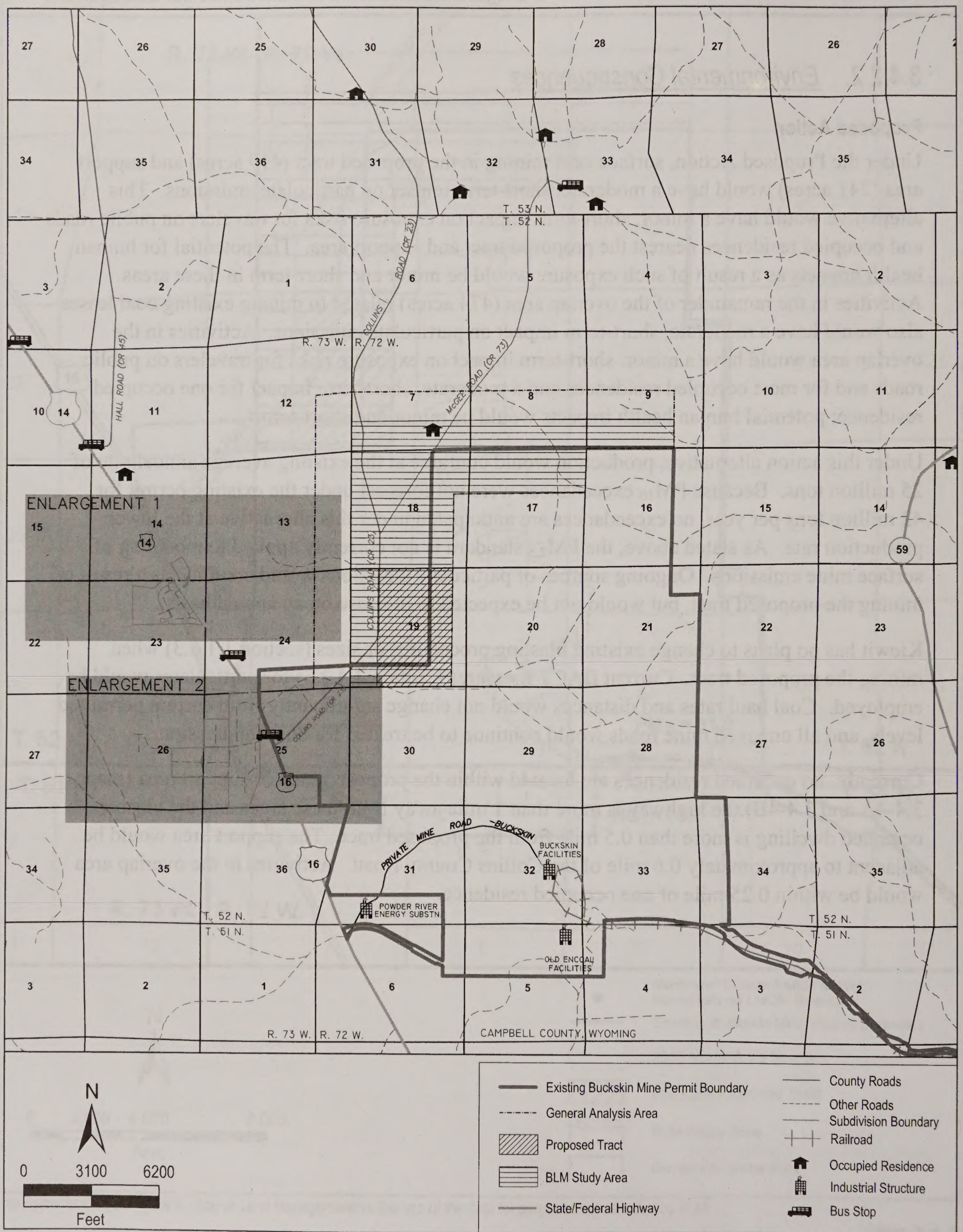
Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and support area (241 acres) would have a moderate, short-term impact on particulate emissions. This alternative would have a minor, short-term impact on exposure risks for travelers on public roads and occupied residences nearest the proposed tract and support area. The potential for human health impacts as a result of such exposure would be minor and short-term in these areas. Activities in the remainder of the overlap area (474 acres) related to mining existing coal leases also would have a moderate, short-term impact on particulate emissions. Activities in the overlap area would have a minor, short-term impact on exposure risks for travelers on public roads and for most occupied residences and a moderate, short-term impact for one occupied residence; potential human health impacts would be minor and short-term.

Under this action alternative, production would continue at the existing average annual rate of 25 million tons. Because PM_{10} exceedances were not forecast under the existing permit for 42 million tons per year, no exceedances are anticipated under this alternative at the lower production rate. As stated above, the $PM_{2.5}$ standard is not currently applied to modeling of surface mine emissions. Ongoing sources of particulate emissions would continue as a result of mining the proposed tract, but would not be expected to increase on an annual basis

Kiewit has no plans to change existing blasting procedures or sizes (section 1.1.3.3) when mining the proposed tract. Current BACT measures (section 3.4.2.3) for particulates would be employed. Coal haul rates and distances would not change significantly from current permitted levels, and all unpaved mine roads would continue to be treated for dust suppression.

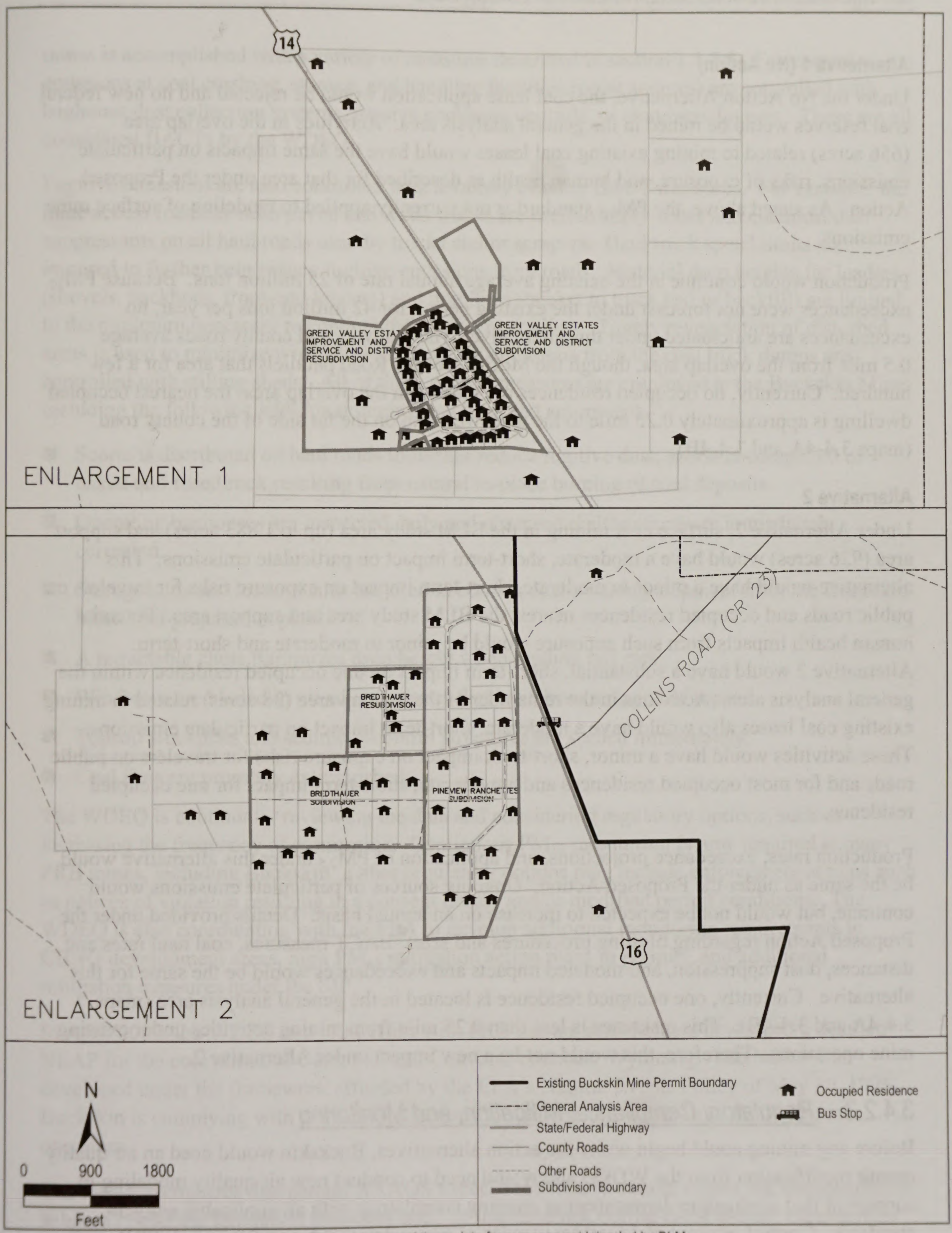
Currently, no occupied residences are located within the proposed tract or support area (maps 3.4-4A and 3.4-4B).the highway is more than 1 mile away from these areas and the closest occupied dwelling is more than 0.5 mile from the proposed tract. The support area would be adjacent to approximately 0.6 mile of the Collins County Road. Activities in the overlap area would be within 0.25 mile of one occupied residence.



No warranty is made by the Bureau of Land Management for use of these data for purposes not intended by BLM.

Map 3.4-4A

Roads, Highways, Occupied Dwellings, Businesses, and School Bus Stops in the Vicinity of the General Analysis Area



No warranty is made by the Bureau of Land Management for use of these data for purposes not intended by BLM.

Map 3.4-4B

Enlargement—Roads, Highways, Occupied Dwellings, Businesses, and School Bus Stops in the Vicinity of the General Analysis Area

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have the same impacts on particulate emissions, risks of exposure, and human health as described for that area under the Proposed Action. As stated above, the $PM_{2.5}$ standard is not currently applied to modeling of surface mine emissions.

Production would continue at the existing average annual rate of 25 million tons. Because PM_{10} exceedances were not forecast under the existing permit for 42 million tons per year, no exceedances are anticipated under this alternative. The highway and county roads average 0.5 mile from the overlap area, though the McGee County Road parallels that area for a few hundred. Currently, no occupied residences are located in the overlap area; the nearest occupied dwelling is approximately 0.25 mile to the northwest and on the far side of the county road (maps 3.4-4A and 3.4-4B).

Alternative 2

Under Alternative 2, surface coal mining in the BLM study area (up to 1,883 acres) and support area (926 acres) would have a moderate, short-term impact on particulate emissions. This alternative would have a minor to moderate, short-term impact on exposure risks for travelers on public roads and occupied residences nearest the BLM study area and support area. Potential human health impacts from such exposure would be minor to moderate and short-term.

Alternative 2 would have a substantial, short-term impact on one occupied residence within the general analysis area. Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases also would have a moderate, short-term impact on particulate emissions. These activities would have a minor, short-term impact on exposure risks for travelers on public roads and for most occupied residences and a moderate, short-term impact for one occupied residence.

Production rates, exceedance projections, and application of $PM_{2.5}$ under this alternative would be the same as under the Proposed Action. Ongoing sources of particulate emissions would continue, but would not be expected to increase on an annual basis. Details provided under the Proposed Action regarding blasting procedures and sizes, BACT measures, coal haul rates and distances, dust suppression, and modeled impacts and exceedances would be the same for this alternative. Currently, one occupied residence is located in the general analysis area (maps 3.4-4A and 3.4-4B). This residence is less than 0.25 mile from mining activities under existing mine operations. Therefore, this would not be a new impact under Alternative 2.

3.4.2.3. *Regulatory Compliance, Mitigation, and Monitoring*

Before any mining could begin under the action alternatives, Buckskin would need an air quality permit modification from the WDEQ and would need to conduct new air quality modeling in support of that application demonstrating ongoing compliance with all applicable ambient standards. Control of point and fugitive sources of particulates and emissions at all PRB coal

mines is accomplished with a variety of measures described in section 1.1.3.3. For example, emissions at coal crushing, storage, and handling facilities (point sources) are controlled with baghouse dust collection systems, passive enclosure controls, or atomizers/foggers. These are all considered BACTs by the WDEQ.

Fugitive emissions are also controlled with a variety of other BACT measures. For example, the mine access road has been paved and water trucks are used to apply water and chemical dust suppressants on all haul roads used by trucks and/or scrapers. Haul truck speed limits are imposed to further help reduce fugitive emissions from roads. Material drop heights for loaders (shovels, backhoes, front-end loaders) and draglines (bucket to truck bed or backfill) are limited to the minimum necessary to conduct the mining operations. Timely revegetation of disturbed areas is used to minimize wind erosion. Fugitive emissions from the coal truck dumps are controlled with stilling sheds. All of these control measures are employed at the Buckskin Mine, including the following additional mining practices and equipment.

- Scoria is distributed on haul roads to further reduce fugitive dust; scoria is comprised of baked and fused rock resulting from natural in-place burning of coal deposits.
- Operating baghouses are inspected daily and observed malfunctions are immediately corrected.
- Storage silos and loadout silos are used to contain coal awaiting shipment from the Buckskin Mine coal preparation plant.
- A retractable chute minimizes drop height when loading rail cars.
- Windrows are bladed in pit advance areas that have been stripped of topsoil.
- Topsoil stockpiles and sediment-control structures are seeded immediately.
- Coal fires are promptly extinguished.

The WDEQ is continually reviewing the data and considering regulatory options, such as increasing the frequency of monitoring. Continuous PM_{10} monitoring is now required at many PRB mines, including Buckskin. Other regulatory options may include enforcement actions such as notices of violation resulting in a consent decree and/or modified permit conditions. The WDEQ is also coordinating with the EPA to develop additional monitoring requirements in CBNG development areas, high PM_{10} mitigation action plans in permits, and additional mitigation measures under the SIP.

In April 2006, the WDEQ in a joint effort with PRB mining stakeholders developed a detailed NEAP for the coal mines of Campbell and Converse counties, Wyoming. The NEAP was developed under the framework afforded by the EPA's Natural Events Policy of May 30, 1996. Buckskin is complying with the NEAP developed jointly by the WDEQ and the PRB coal operators.

The NEAP recognizes that certain NAAQS exceedances due to natural events are uncontrollable. While all practical mitigation measures need be implemented during those events, exceedances

attributable to natural events should not be considered against the NAAQS attainment designation for the region. Specific NEAP goals include:

- Provide for the protection of public health.
- Develop a public information program.
- Provide a mechanism for "flagging" exceedances due to uncontrollable natural events.
- Implement best available control measures and reasonably available control measures based on the severity of the event.
- Provide a mechanism for excluding flagged data when they meet specific wind speed criteria and best available and reasonably available control measures are in place.

The PRB mining operators had already implemented these measures for several years when formal approval of the NEAP was received from EPA Region VIII in 2007.

While the basinwide NEAP was developed to address exceedances of the 24-hour PM_{10} standard that are attributable to high wind events, additional procedures have been formalized at each mine to address potential exceedances. Buckskin has in place mitigation procedures and an action plan to avoid exceedances of the 24-hour ambient air quality standard at the two continuous particulate (PM_{10}) monitoring systems. The recording of high particulate readings automatically triggers an alarm, which invokes certain actions by Buckskin personnel to address the high readings. This procedure and the specific actions to be taken are detailed in Buckskin's TEOM Action Plan, as approved by the WDEQ. That action plan is included in the Air Quality Data Report, which can be viewed at the High Plains District office of the BLM in Casper, Wyoming.

Through the end of 2001, at minimum, each mine monitored air quality for a 24-hour period every six days at multiple monitoring sites. More recently, monitoring has occurred at active mines for a 24-hour period every three days, with some mines (including Buckskin) conducting continuous monitoring.

Numerous monitors are also located in Sheridan, Gillette, Arvada, and Wright, Wyoming. The extensive air quality monitoring network currently in use enables the WDEQ to manage the air resource using monitoring data rather than modeled predictions. The agency also uses monitoring stations located elsewhere in the state to anticipate issues related to air quality throughout Wyoming. These monitoring stations are located to measure ambient air quality rather than impacts from a specific source.

Monitors located to measure impacts from a specific source may be used to establish trends. These data are used to proactively arrest or reverse trends towards air quality problems. When the WDEQ became aware that particulate readings in the PRB were increasing due to increased CBNG activity and prolonged drought, the agency approached the counties, coal mines, and CBNG industry. A coalition involving those entities has made significant efforts towards minimizing dust from graded roads. Measures taken have ranged from implementing speed limits to paving heavily traveled roads. As a participant in this program, the Buckskin Mine has

periodically applied magnesium chloride to two county roads (the Collins Road and the McGee Road) and a secondary access road. All of these measures are believed to have reduced the impacts of nearby, non-mining activity on Buckskin's monitors.

Monitoring is also used to measure compliance. When monitoring shows that any standard has been violated, the WDEQ can take a range of enforcement actions to remedy the situation. Where a standard is exceeded specific to an operation, the enforcement action is specific to the facility. For many facilities, neither the cause nor the solution is simple. The agency normally uses a negotiated settlement in those instances.

3.4.3. Emissions of Nitrogen Oxides and Ozone

3.4.3.1. *Affected Environment*

Gases that contain nitrogen and oxygen in varying amounts are referred to as nitrogen oxides, or NO_x. One type of NO_x is NO_2, a reddish-brown gas that is heavier than air and has a pungent odor. NO_2 is by far the most toxic of this group and can combine with atmospheric moisture to form nitric acid and nitric oxide. Because several NO_x species can be chemically converted to NO_2 in the atmosphere, NO_2 emissions control is focused on all NO_x gases, while the ambient standard is expressed in terms of NO_2.

NO_x forms when fuel is burned at high temperatures either naturally or by human activities. The primary direct source of NO_x emissions during coal mining operations is tailpipe emissions from mining equipment and other vehicle traffic inside the mine permit area. Blasting that is done to remove overburden can result in emissions of several products, including NO_2, because of the incomplete combustion of explosives used in the blasting process. When this occurs, gaseous, orange-colored clouds may be formed, and they can drift or be blown off mine permit areas. The rate of release is not well known but is believed to depend on a wide number of factors which include, but are not necessarily limited to: downhole confinement; downhole moisture; type/blend of ammonium nitrate, fuel oil, and emulsion; and detonation velocity.

Various compounds and derivatives in the NO_x family, including NO_2, nitric acid, nitrous oxide (N_2O), nitrates, and nitric oxide, may cause a wide variety of health and environmental impacts. According to the EPA (2007b), the following are the main causes of concern with respect to NO_x:

- It is one of the main precursors involved in the formation of ground-level ozone, which can trigger serious respiratory problems.
- It reacts to form nitrate particles, acid aerosols, as well as NO_2, which also cause respiratory problems; and affects air quality related values (AQRVs) of visibility and deposition.
- It contributes to the formation of acid rain.
- It contributes to nutrient overload that deteriorates water quality.

- It contributes to atmospheric particles that cause visibility impairment, most noticeably in national parks.
- It reacts to form toxic chemicals.
- N_2O is a greenhouse gas (GHG) that contributes to climate change.
- It can be transported over long distances.

That agency also associates the following severe health risks specifically with NO_2 (EPA 2001a):

- It may cause significant toxicity because of its ability to form nitric acid with water in the eye, lung, mucous membranes, and skin.
- Acute exposure may cause death by damaging the pulmonary system.
- Chronic or repeated exposure to lower concentrations of NO_2 may exacerbate pre-existing respiratory conditions, or increase the incidence of respiratory infections.

Potential health risks associated with inhalation of ground-level ozone and NO_x related particles include acute respiratory problems, aggravated asthma, decreases in lung capacity in some healthy adults, inflammation of lung tissue, respiratory-related hospital admissions and emergency room visits, and increased susceptibility to respiratory illnesses, including bronchitis and pneumonia (EPA 2007c). Adjacent landowners to the north of the Buckskin Mine have contacted and met with mine personnel on various occasions regarding their concerns about smoke from coal fires at the mine, NO_2, and dust. The landowners and mine representatives are actively working to resolve those issues. The landowners have expressed similar concerns to the WDEQ. Nevertheless, WDEQ the agency has not required Buckskin to implement any specific measures to control or limit public exposure to NO_2 from blasting, such as restrictions regarding blasting size, setbacks, or other parameters.

Although no NAAQS or WAAQS regulate short-term NO_2 levels, concern does exist about the potential health risk associated with short-term exposure to NO_2 from blasting emissions. The National Institute for Occupational Safety and Health (NIOSH) (NIOSH 2005), the Occupational Safety and Health Administration (OSHA) and the EPA have identified the following short-term exposure criteria for NO_2:

- NIOSH's recommended "immediately dangerous to life and health" level is 20.0 parts per million (37,600 $\mu g/m^3$).
- EPA's "significant harm" level, a 1-hour average, is 2.0 parts per million (3,760 $\mu g/m^3$).
- OSHA's "short-term exposure limit," a 15-minute time weighted average, which was developed for workers, is 5.0 parts per million (9,400 $\mu g/m^3$, which must not be exceeded during any part of the workday, as measured instantaneously).
- NIOSH's recommendation for workers is a limit of 1.0 parts per million (1,880 $\mu g/m^3$) based on a 15-minute exposure that should not be exceeded at any time during the workday.
- EPA recommends that concentrations not exceed 0.5 parts per million (940 $\mu g/m^3$) for a 10-minute exposure to protect sensitive members of the public (EPA 2003a).

A study conducted by Dr. Edward Faeder for the Black Thunder Mine recommended a limit of 5.0 parts per million (9,400 $\mu g/m^3$) for a 10-minute exposure.

According to the EPA, "The exact concentrations at which NO_2 will cause various health effects cannot be predicted with complete accuracy because the effects are a function of air concentration and time of exposure, and precise measurements have not been made in association with human toxicity. The information that is available from human exposures also suggests that there is some variation in individual response" (EPA 2001a).

Many mines in the PRB have implemented procedures aimed at reducing the amount of NO_x, particularly NO_2, released from the incomplete combustion of blasting agents; blasting NO_x is most often associated with cast blasting, which is used at larger mines with dragline operations. Because blast clouds are of a short-term, transient nature, the level of short-term exposure deemed to be "safe" is unknown. While this issue remains the subject of great debate, it should be noted that neither the EPA nor WDEQ has established NAAQS for NO_2 for averaging times shorter than one year. Despite extensive expert testimony provided to the Wyoming Environmental Quality Commission during hearings conducted in 2002 that argued for the establishment of a de facto "standard" ranging from 0.5 to 5.0 parts per million for a 10-minute exposure, the agency determined that insufficient evidence was available to establish a short-term exposure limit and concluded that additional study was required.

On the order of the Director of the WDEQ, members of the mining industry in the PRB conducted a comprehensive, multi-year monitoring and modeling study of NO_2 exposures from blast clouds. Based on results from that study (Thunder Basin Coal Company 2002) and supplemental data collected at the Buckskin Mine and elsewhere in the PRB, a series of "safe" setback curves for coal, overburden, and cast shots for various wind speed classes was derived from the sampled data, conservative projections of concentrations at greater/lesser distances than measured, and an assumed safe level (based on a comprehensive review of available health effects data) of 5.0 parts per million for 10 minutes. Appendix F provides additional details about this study and the data collection process.

Thus, while disagreement still exists regarding acceptable exposure levels, a large amount of actual data is now available from which informed decisions can be made regarding blasting practices. Regardless of the outcome of the debate on the allowable exposure level, the data show clearly that reduction in blast size and increases in setback distances are effective methods for mitigating the frequency and extent of public exposures.

Public exposure to emissions caused by surface mining operations is most likely to occur along public roads and highways that pass through the area of the mining operations. Occupants of dwellings in the area could also be affected. Sources of fugitive NO_x emissions at the Buckskin Mine include the tailpipe emissions from the mining equipment, emissions from the trains used to haul the coal from the mine, and blasting the overburden and coal to facilitate excavation. As described in section 1.1.3.3, the Buckskin Mine does not use cast blasts to move overburden, though other blasting techniques are used in this process. Although all blasting methods have

some potential for NO_x emissions, cast blasts are the most likely source. No NO_x point sources occur at the mine.

The WDEQ has determined that an assessment of annual NO_x impacts must be included as part of an air quality permitting analysis for new surface coal mines and existing mine plan revisions. The potential NO_x emissions related to mining operations at the existing Buckskin Mine are described in the air quality permit application submitted to the WDEQ in June 2006; the purpose of the permit revision request was described in section 3.4.2.1.

NO_x modeling was conducted in support of that June 2006 air permit application. Mining sources of NO_x were modeled as fugitive emissions from the areas where mining activities were projected to occur at Buckskin and the other five mines in the northern PRB. These included the overburden and coal blasting emissions, mobile emissions, and stationary emissions described in section 3.4.1.3. Regional sources of NO_x were also modeled, including local power plants, gas compressor stations, railroads, highways, and the City of Gillette. Individual and combined impacts from Buckskin, the other northern mines, and regional sources were evaluated at all model receptors. These receptors were placed around the perimeter of the northern group of mines and outward in a rectangular grid with 500-meter spacing. The extent of the receptor grid was sufficient to encompass the area of significant NO_x impact from the Buckskin Mine (1.0 $\mu g/m^3$ or more).

NO_2 impacts were derived by multiplying modeled NO_x concentrations by 75% and adding a background NO_2 concentration of 14 $\mu g/m^3$. This approach followed 40 CFR Part 51, section 6.2.3, appendix W of the EPA's Guideline on Air Quality Models. The background NO_2 concentration was based on WDEQ guidance and ambient NO_x monitoring results at the Foundation Coal's Belle Ayr Mine in 2001 and 2002; that mine is approximately 20 miles southeast of the Buckskin Mine. Additional descriptions of the modeling process for this analysis is provided in appendix G.

Maximum annual NO_2 impacts (including regional sources and background concentration) at any model receptor of 38.0 $\mu g/m^3$ and 37.8 $\mu g/m^3$ were predicted in 2011 and 2012 respectively. Both of those values were considerably lower than the annual NO_2 NAAQS of 100 $\mu g/m^3$. At the model receptor where these predicted maximum values were calculated, Buckskin's contributions were estimated at 1.6 $\mu g/m^3$ in 2011 and 1.8 $\mu g/m^3$ in 2012. This receptor is located in an area affected primarily by neighboring mines. A background NO_2 concentration of 14 $\mu g/m^3$ was assumed based on WDEQ guidance and ambient NO_x monitoring results at the Belle Ayr Mine in 2001 and 2002. Maps 3.4-2 and 3.4-3 show maximum modeled impacts at the Buckskin Mine boundary receptors of 35.6 $\mu g/m^3$ and 35.7 $\mu g/m^3$ in 2011 and 2012, respectively. Because modeled impacts from the worst-case years fall well below the NAAQS, the NO_2 NAAQS will be protected throughout the life of the mine.

Ozone is a regulated air pollutant that can cause respiratory health effects in people with chronic respiratory problems. Ozone develops in the atmosphere as a result of other pollutants, such as NO_x and volatile organic compounds (VOC) – called precursors. In March 2008, the EPA promulgated a revised NAAQS for ozone (75 FR 11). The ozone standard was lowered from

80 parts per billion to 75 parts per billion based on the fourth highest 8-hour average value per year at a site, averaged over three years. On January 6, 2010, the EPA proposed to strengthen the ozone standard by lowering the primary 8-hour standard to somewhere between 60 and 70 parts per billion (75 FR 11). The final standard is expected in mid-2011. Ozone readings have occasionally exceeded the current standard of 75 parts per billion at the Thunder Basin air monitoring site in Campbell County. Violations of the standard have occurred in the Upper Green River Basin (UGRB) of Wyoming where certain conditions promote ozone formation. As a result of the violations of the ozone standard in that region, former Governor Freudenthal submitted a recommendation to the EPA on March 12, 2009 that the agency should designate the UGRB as an ozone nonattainment area.

The northern PRB is still considered an ozone attainment area. Table 3.4-4 shows maximum, mean, and fourth highest daily 8-hour high averages for the last five years at a monitor located 20 miles northeast of the Buckskin Mine. While no violations occurred, it is apparent that ambient air in the project area is close to the ozone NAAQS, which applies to the fourth highest daily 8-hour high. This may reflect increased oil and gas activities in the area, increased coal mining in the PRB, ozone transport from other regions such as the UGRB, or a combination of these factors.

Table 3.4-4. Thunder Basin National Grassland Average Ozone Monitoring Results (Parts per Billion) for Last Five Years

Year	Maximum Daily 8-Hour High	Mean Daily 8-Hour High	Fourth Highest Daily 8-Hour High[a]	NAAQS[b]
2005	68	42	63	75
2006	75	45	72	75
2007	81	44	72	75
2008	78	49	74	75
2009	71	47	62	75

NAAQS = National Ambient Air Quality Standards

[a] Ambient air value used for comparisons with NAAQS

[b] Based on 8-hour rolling average.

Source: 75 FR 11.

It is evident from Table 3.4-4 that such lowering of the standard as proposed by the EPA would potentially trigger non-attainment status for ozone in the northern PRB. The impact of non-attainment status on surface coal mines in the PRB is currently unclear. It would likely require any coal mine seeking a new or renewed air quality permit from the WDEQ to demonstrate that ozone precursor emissions (NO_x and VOC) will not increase as a result. Because Kiewit has no plans to increase production levels at the Buckskin Mine under the Proposed Action, such a demonstration can be made.

3.4.3.2. Environmental Consequences

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and support area (241 acres) would have a minor to moderate, short-term impact on NO_x emissions. This alternative would have a minor to substantial, short-term impact on exposure risks for travelers on public roads and occupied residences nearest the proposed tract and support area, depending on their distance from emissions sources. The potential for human health impacts from such exposure would be minor and short-term in these areas. Activities in the remainder of the overlap area (474 acres) related to mining existing coal leases also would have a moderate, short-term impact on NO_x emissions. Activities in the overlap area would have a minor, short-term impact on exposure risks for travelers on public roads and for most occupied residences and a moderate, short-term impact for one occupied residence; potential human health impacts would be minor and short-term.

Production would continue at the existing average annual rate of 25 million tons. Because NO_x exceedances were not forecast under the existing permit for 42 million tons per year, no exceedances are anticipated under this alternative. Ongoing sources of short-term NO_x emissions would continue as a result of mining the proposed tract, but would not be expected to increase on an annual basis. Because the Buckskin Mine does not plan to increase production levels under the Proposed Action, a demonstration that ozone precursor emissions (NO_x and VOC) will not exceed pending changes to the primary ozone standard cannot be made. Kiewit has no plans to change blasting procedures or sizes (section 1.1.3.3) when mining the proposed tract, but is committed to working with adjacent landowners to address concerns when they arise. Current control and notification measures for NO_x emissions (section 3.4.3.3) would be modified to the extent possible to address concerns by adjacent landowners.

Currently, no occupied residences are located within the proposed tract or support area (maps 3.4-4A and 3.4-4B). The highway is more than 1 mile away from these areas and the closest dwelling is more than 0.5 mile from the proposed tract. The support area would be adjacent to approximately 0.6 mile of the Collins County Road. Activities in the overlap area would be within 0.25 mile of one occupied residence.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have the same impacts on NO_x emissions, risks of exposure, and human health as described for that area under the Proposed Action. Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area.

Production would continue at the existing average annual rate of 25 million tons. Because NO_x exceedances were not forecast under the existing permit for 42 million tons per year, no exceedances are anticipated under this alternative. Ongoing sources of NO_x emissions (e.g.,

vehicles, blasting [not cast-blasting]) would be limited to the overlap area and would be associated with activities necessary to support mining on existing leases. Because the Buckskin Mine does not plan to increase production levels under the Proposed Action, a demonstration that ozone precursor emissions (NO_x and VOC) will not exceed pending changes to the primary ozone standard cannot be made. The highway and county roads average 0.5 mile from the overlap area, though the McGee Road parallels that area for a few hundred feet. Currently, no occupied residences are located in the overlap area; the nearest occupied dwelling is approximately 0.25 mile to the northwest and on the far side of the county road (maps 3.4-4A and 3.4-4B). The Buckskin Mine works with adjacent landowners to address concerns when they arise. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, impacts associated with NO_x emissions would be the same as those described under the Proposed Action for most circumstances. This alternative would have a substantial, short-term impact on one occupied residence within the general analysis area.

Production would continue at the existing average annual rate of 25 million tons. Because NO_x exceedances were not forecast under the existing permit for 42 million tons per year, no exceedances are anticipated under this action alternative. Ongoing sources of short-term NO_x emissions would continue as a result of mining in up to 1,883 acres of the BLM study area, but would not be expected to increase on an annual basis. Because the Buckskin Mine does not plan to increase production levels under the Proposed Action, a demonstration that ozone precursor emissions (NO_x and VOC) will not exceed pending changes to the primary ozone standard cannot be made. Details provided under the Proposed Action regarding blasting procedures and sizes, BACT measures, coal haul rates and distances, dust suppression, and modeled impacts and exceedances would be the same for this alternative. Kiewit has no plans to change its blasting procedures or scale associated with mining in the BLM study area, but is committed to working with adjacent landowners to address concerns when they arise. Current control and notification measures for NO_x emissions would be modified to the extent possible to address concerns by adjacent landowners.

Currently, one occupied residence is located in the general analysis area (maps 3.4-4A and 3.4-4B). This residence is less than 0.25 mile from mining activities under existing mine operations. Therefore, this would not be a new impact under Alternative 2.

3.4.3.3. *Regulatory Compliance, Mitigation, and Monitoring*

Before any mining of the proposed tract could begin, the Buckskin Mine would need an air quality permit modification from the WDEQ and would need to conduct new air quality modeling in support of that application demonstrating ongoing compliance with all applicable ambient standards.

As described in section 3.4.3.2, the WDEQ has received no reports of public exposures to NO_2 from blasting activities conducted at the Buckskin Mine; therefore, the agency has not required

the mine to implement any specific measures to control or limit public exposure to mine emissions. Additionally, the mine does not use cast blasts to move overburden; that is the most common source of the NO_2 clouds of greatest concern to local residents. Nevertheless, Buckskin has voluntarily committed to employ a variety of notification and control measures associated with blasting emissions in a good-faith effort to keep the public informed of blasting activities. Several other surface coal mines in the PRB use similar voluntary blasting notification and control measures to avoid NO_2 impacts on the public.

Voluntary measures that have been instituted at Buckskin (and other mines), particularly when large blasts are planned, include:

- notifying neighbors by telephone (both private parties and other mining operations) in the general area of the mine prior to large blasts;
- monitoring weather and atmospheric conditions prior to the decision to detonate a large blast;
- minimizing blast size to the extent possible;
- posting signs on major public roads that enter the general mine area and on all locked gates accessing the active mine area;
- closing public roads that enter the general mine area, depending on wind conditions and blast location with respect to the road; and
- providing post-blast notification to neighbors of potential exposure to the blasting cloud.

The WDEQ has required several mines, including the neighboring Eagle Butte and Wyodak mines (map 1-1), to stop traffic on adjacent state and federal highways during blasting because of concerns with fly rock and the "startle factor." The agency does not require the Buckskin Mine to stop traffic because the blasting area does not affect any major public roads.

NO_2 was monitored in Gillette from 1975 through 1983. Because of public concerns about NO_2 emissions from blasting (particularly cast blasts) and a general concern by the WDEQ about levels of NO_x from all types of development in the PRB, the coal mining industry instituted a monitoring network in cooperation with the agency to gather data on those emissions beginning in 2001. Additional monitoring was conducted throughout the PRB from 2003 to 2006. Details regarding funding and ownership of the coal monitoring program are provided in appendix G.

The results of the most recent NO_x monitoring are summarized in table 3.4-5. The results indicate annual average NO_2 concentrations at all sites are well below the NAAQS of 100 $\mu g/m^3$. The WDEQ and respective mines maintain these monitoring stations, and the agency relies on the ongoing monitoring data and emission inventories in air quality permit applications to demonstrate compliance with the annual NO_2 ambient air standard.

Table 3.4-5. Annual Ambient NO_2 Concentration Data ($\mu g/m^3$)

Year	Antelope Mine	Belle Ayr Mine	Thunder Basin National Grassland	Campbell Co.	Tracy Ranch
2003	7.5	13.2	5.6	13.2	
2004	2.9	10.3	3.8	9.4	5.5
2005	5.5	9.5	8.4	7.5	7.2
2006	5.1	14.4	8.1	5.7	11.2
2007			3.8	7.5	6.9

$\mu g/m^3$ = micrograms per cubic meter; NO_2 = nitrogen dioxide

Source: EPA 2009b.

On February 9, 2010, the EPA published a primary, 1-hour standard for NO_2 (75 FR 26). Effective April 12, 2010, the standard is set at a level of 100 parts per billion, based on the three-year average of the 98th percentile of the yearly distribution of 1-hour daily maximum concentrations. The rationale for this new standard is the protection of public health, based on the latest scientific knowledge.

To date, the WDEQ air quality permitting process has not required the Buckskin Mine to perform short-term modeling of NO_2 impacts. Therefore, no model outputs are currently available to assess the mine's compliance with the 1-hour NAAQS standard for NO_2. It is anticipated that short-term modeling will be required at a future date, pending incorporation of the new 1-hour NO_2 standard in Wyoming's SIP and WAQSR.

In the Final Rule, the EPA acknowledged that the data from the current nationwide NO_2 network is inadequate to fully assess compliance with the revised NAAQS. As a result, the EPA is in the process of promulgating new NO_2 monitoring network design requirements (75 FR 26). Notwithstanding this deficiency, historical NO_2 concentrations are available on an hourly basis at two monitoring sites in the northern PRB. These data afford a surrogate measure of compliance with the 1-hour standard in the general area of the Buckskin Mine. Both monitors record hourly average ambient NO_2 concentrations.

The first monitor is located on the Thunder Basin National Grassland (TBNG), 20 miles northeast of the Buckskin Mine. Located upwind from mining activity in the northern PRB, the TBNG monitor is believed to represent background concentrations. The data record at this site is continuous for the most recent five-year period (2005–2009), making it possible to calculate a 2007-2009 three-year average of the 98th percentile of the yearly distribution of 1-hour daily maximum NO_2 concentrations.

The second monitor is located near the Belle Ayr Mine (BAM), approximately 20 miles southeast of Buckskin. This monitor lies in an area potentially affected by several nearby coal mines. The data record at this site is intermittent during the 2005 through 2009 period because of changes in ownership of the monitor. Thus, it is not possible to directly calculate a recent, three-year average of the 98th percentile of the yearly distribution of 1-hour daily maximum NO_2

concentrations for this location. However, data recovery for years 2005, 2006, and 2009 were sufficient to compute a non-consecutive, three-year average.

Table 3.4-6 summarizes hourly NO_2 monitoring results for the TBNG and BAM sites. The three-year averages for the two sites reflect the calculation methods discussed above. Based on the TBNG monitor, a background concentration of 11 parts per billion can be compared to the NAAQS of 100 parts per billion, where both apply to the three-year average of the 98th percentile of the yearly distribution of 1-hour daily maximum NO_2 concentrations. The BAM monitor shows a comparable three-year average of nearly 35 parts per billion (after omitting incomplete data years), roughly three times the background value but one-third of the NAAQS standard.

Table 3.4-6. 1-hour NO_2 Concentrations (parts per billion)

Year	Thunder Basin National Grassland (TBNG)				Belle Ayr Mine (BAM)			
	Valid Days	High	98th Percentile	Average	Valid Days	High	98th Percentile	Average
2005	365	21.00	12.00	6.72	287	38.09	33.66	14.51
2006	365	32.00	12.00	4.49	359	150.80	38.92	22.51
2007	342	21.00	11.00	4.28	72	46.42	46.42	21.77
2008	278	14.00	11.00	4.27	0	N/A	N/A	N/A
2009	323	14.00	11.00	4.17	268	73.80	32.30	14.58
	3-Yr Avg	11.00 parts per billion			34.96 parts per billion			

N/A = Not applicable NO_2 = nitrogen dioxide
Source: Argonne 2002.

On June 2, 2010, the EPA issued a new 1-hour ambient standard for SO_2 (EPA-HQ-OAR-2007-0352, RIN 2060-A048). The new standard is 75 parts per billion, applied to the three-year average of the 99th percentile (fourth highest) of the annual distribution of hourly averages.

IML operates two SO_2 monitors in the PRB, one for Black Hills Power (BHP) at the Wyodak site east of Gillette, and one for Wyoming Refining in Newcastle. Both monitors are near (and downwind from) major sources of SO_2. The closest monitor is at BHP, approximately 15 miles southeast of the Buckskin Mine. In the last eight years, BHP has recorded only two hourly readings above 75 parts per billion (98.3 parts per billion on 3/13/07 and 77.4 parts per billion on 7/30/2008). Wyoming Refining shows similar results (207.8 parts per billion on 11/19/08 and 89.7 parts per billion on 9/28/05). Despite the fact that the monitors have been placed explicitly to measure impacts from major sources of SO_2, neither site has violated the new 1-hour standard of 75 parts per billion, which applies to the three-year average as described above. Table 3.4-7 shows the most recent three-year average of the 99th percentile of the annual distribution of hourly averages at BHP to be 61.1 parts per billion.

Total SO_2 emissions from the Buckskin Mine for the year 2008 were calculated to be 32.3 tons (Buckskin Mining Company 2009). The primary source of these emissions is diesel fuel combustion, which would continue at roughly the same rate under the Proposed Action. SO_2 emissions from the Wyodak site, which includes several coal-fired power plants operated by BHP and Pacificorp, total in the thousands of tons per year. Based on the demonstration of historical compliance at the Wyodak site and the fact that SO_2 emissions at Wyodak exceed those at the Buckskin Mine by two orders of magnitude, ambient impacts from Buckskin are expected to be well below the new EPA SO_2 air quality standard.

Table 3.4-7. 1-hour SO_2 Concentrations (parts per billion) Black Hills Power (Wyodak site)

Year	High	99th Percentile	Average
2007	21.00	61.2	4.28
2008	14.00	61.9	4.27
2009	14.00	60.3	4.17
	3-Year Average	61.1	

SO_2 = sulfer dioxide
Source: Quick et al. 2003.

3.4.4. Visibility

Visibility refers to the clarity with which scenic vistas and landscape features are perceived at great distances. Visibility can be defined as the distance one can see and the ability to perceive color, contrast, and detail. $PM_{2.5}$ is the main cause of visibility impairment. Visual range, one of several ways to express visibility, is the farthest distance from which a person can see a landscape feature. Without the effects of human-caused air pollution, a natural visual range is estimated to be about 140 miles in the western part of the United States and 90 miles in the eastern part (EPA 2001b). Presently, the visibility conditions monitored in the Bridger Wilderness Area are among the best in the United States.

Visibility impairment is expressed in terms of deciview (dv). The dv index was developed as a linear perceived visual change (Pitchford and Malm 1994), and is the unit of measure used in the EPA's regional haze rule to achieve the national visibility goal. This goal was established as part of the CAA to prevent any future, and remedy any existing, impairment of visibility in mandatory federal class I areas that result from human-caused air pollution. The dv index is a scale related to visual perception that has a value near zero for a pristine atmosphere. A change in visibility of 1.0 dv represents a "just noticeable change" by an average person under most circumstances. Increasing dv values represent proportionately larger perceived visibility impairment.

3.4.4.1. *Affected Environment*

Air quality related values, including the potential air pollutant effects on visibility, are applied to pristine attainment PSD Class I (e.g., national parks) and sensitive Class II (areas outside

designated Class I zones) areas; those classifications are described in more detail in section 2.3 of appendix G. The land management agency responsible for the Class I area (most restrictive) sets a limit of acceptable change for each AQRV. The AQRVs reflect the land management agency's policy and are not legally enforceable standards. Table 3.4-8 shows approximate distances and directions from the general analysis area to 31 PSD Class I and sensitive Cass II areas in the vicinity of the PRB.

Table 3.4-8. Distances and Directions from the General Analysis Area to Sensitive Air Quality Areas

	Distance (miles)	Direction to Receptor
MANDATORY FEDERAL PSD CLASS I AREA		
Badlands National Park[a]	165	ESE
Bridger Wilderness Area	225	WSW
Fitzpatrick Wilderness Area	215	WSW
Gates of the Mountain Wilderness Area	343	NW
Grand Teton National Park	265	WSW
North Absaroka Wilderness Area	210	WNW
Red Rocks Lake Wilderness Area	307	W
Scapegoat Wilderness Area	393	NW
Teton Wilderness Area	237	WSW
Theodore Roosevelt National Park (North Unit)	242	NNE
Theodore Roosevelt National Park (South Unit)	196	NNE
U.L. Bend Wilderness Area	287	NW
Washakie Wilderness Area	215	WSW
Wind Cave National Park	123	SE
Yellowstone National Park	236	W
TRIBAL FEDERAL PSD CLASS I		
Fort Peck Indian Reservation	252	N
Northern Cheyenne Indian Reservation	74	NNW
FEDERAL PSD SENSITIVE CLASS II		
Absaroka-Beartooth Wilderness Area	219	WNW
Agate Fossil Beds National Monument	168	SSE
Bighorn Canyon National Recreation Area	137	WNW
Black Elk Wilderness Area	113	ESE
Cloud Peak Wilderness Area	81	W
Crow Indian Reservation	120	NW
Devils Towner National Monument	42	ENE
Fort Belknap Indian Reservation	316	NNW
Fort Laramie National Historic Site	164	SSE
Jewel Cave National Monument	117	ESE

Table 3.4-8. Continued

	Distance (miles)	Direction to Receptor
Mount Rushmore National Memorial	112	ESE
Popo Agie Wilderness Area	208	SW
Soldier Creek Wilderness Area	197	SE

PSD = prevention of significant deterioration of air quality

[a] The U.S. Congress designated the wilderness area portion of Badlands National Park as a mandatory federal PSD class I area. The remainder of Badlands National Park is a PSD class II area.

The regional haze rule calls for improved visibility on the most impaired days and no additional impairment on the least impaired days (EPA 1999). The EPA participates in the Interagency Monitoring of Protected Visual Environments (IMPROVE) visibility monitoring program as part of its visibility protection program. The IMPROVE monitoring sites were established to be representative of all Class I areas. Figure 3.4-2 shows annual averages for the 20% best, average, and worst visibility days in the Badlands National Park and Bridger Wilderness Area from 1989 through 2005. To date, the Badlands National Park has statistically shown improved visibility on the least impaired days and no change in visibility on the average and most impaired days. The Bridger Wilderness Area has shown no statistically significant change in visibility on the least, average, or most impaired days (IMPROVE 2005).

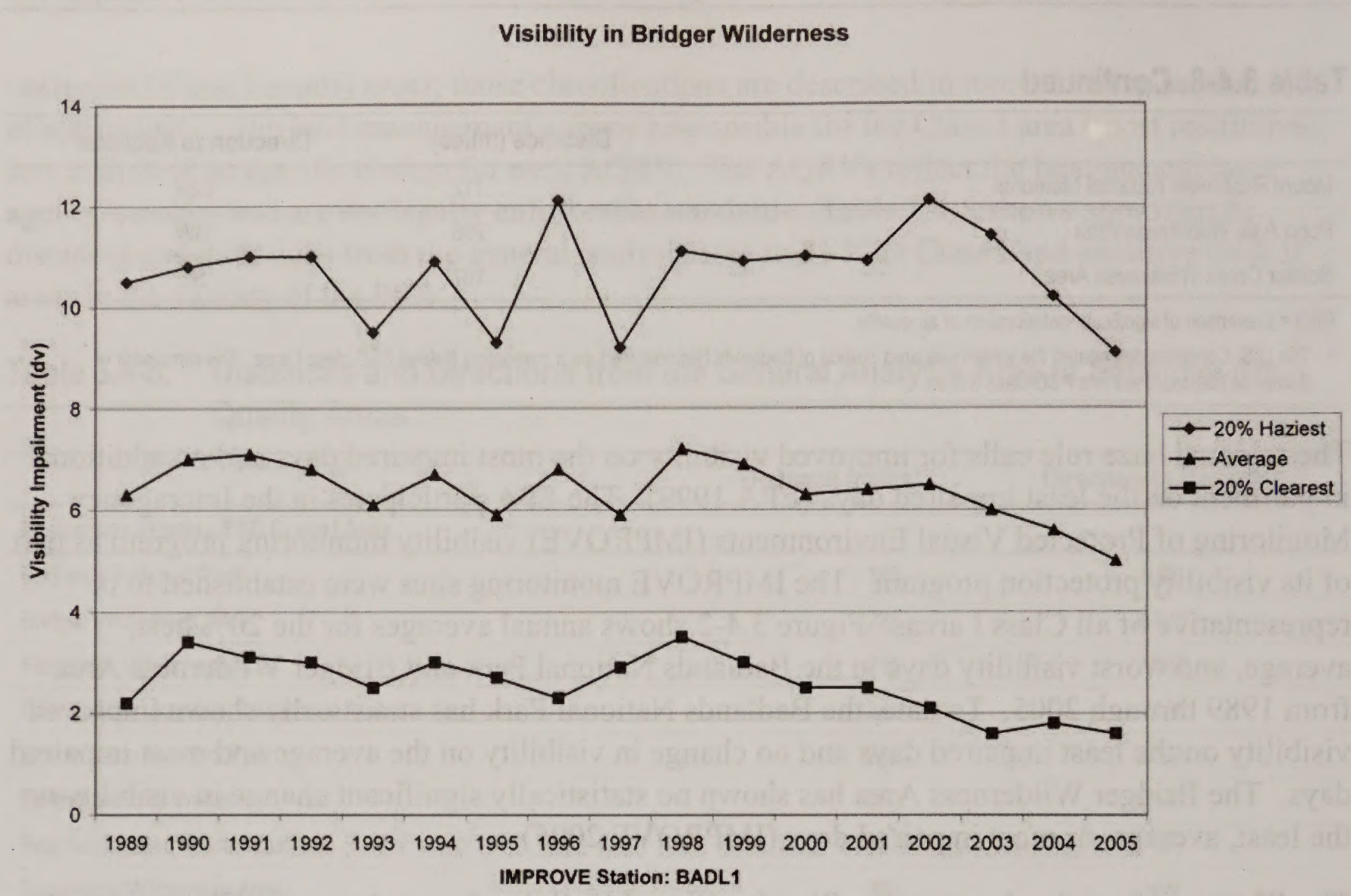
The *Wyoming State Implementation Plan for Class I Visibility Protection* states "Wyoming's long-term strategy will focus on the prevention of any future visibility impairment in Class I areas that can be attributed to a source or small group of sources as the federal land managers have not identified any current impairment in the state's Class I areas due to such sources" (WDEQ 2003). The report is available at http://deq.state.wy.us/aqd/visibility.asp.

Surface coal mines are not considered to be major emitting facilities in accordance with the WDEQ Rules and Regulations (chapter 6, section 4). Therefore, the State of Wyoming does not require mines to evaluate their impacts on class I areas, though the BLM does consider such issues during leasing.

3.4.4.2. *Environmental Consequences*

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and support area (241 acres) would have a minor, short-term impact on visibility. Activities in the remainder of the overlap area (474 acres) related to mining existing coal leases also would have a minor, short-term impact on visibility.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Figure 3.4-2

Visibility in the Badlands National Park and Bridger Wilderness Area

Production would continue at the existing average annual rate of 25 million tons. Because visibility has improved or remained relatively unchanged under the existing permit for 42 million tons per year, only minor changes in visibility are anticipated under this alternative. Ongoing sources of impacts on visibility would continue as a result of mining the proposed tract, but would not be expected to increase on an annual basis. Kiewit has no plans to change blasting procedures or sizes associated with the mining the proposed tract. Coal haul rates and distances would not change significantly from current permitted levels and all unpaved mine roads would continue to be treated for dust suppression. Current BACT measures for particulates (outlined in section 3.4.2.3) that could contribute to impaired visibility would continue to be employed.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have the same impacts on visibility as described under the Proposed Action. As discussed in section 2.2.2, a decision to reject the lease application would not preclude an application to lease a tract in the general analysis area in the future.

Production would continue at the existing average annual rate of 25 million tons. Because visibility has improved or remained relatively unchanged under the existing permit for 42 million tons per year, only minor changes in visibility are anticipated under this alternative.

Alternative 2

Under Alternative 2, surface coal mining in the BLM study area (up to 1,883 acres) and support area (926 acres) would have a minor, short-term impact on visibility. Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases also would have a minor, short-term impact on visibility.

Production would continue at the existing average annual rate of 25 million tons. Because visibility has improved or remained relatively unchanged under the existing permit for 42 million tons per year, only minor changes in visibility are anticipated under this alternative. Ongoing sources of particulate emissions would continue as a result of mining in up to 1,883 acres of the BLM study area, but would not be expected to increase on an annual basis. Kiewit has no plans to change blasting procedures or sizes associated with the mining the proposed tract. Coal haul rates and distances would not change substantially from current permitted levels and all unpaved mine roads would continue to be treated for dust suppression. Current BACT measures for particulates (outlined in section 3.4.2.3) that could contribute to impaired visibility would continue to be employed.

3.4.4.3. *Regulatory Compliance, Mitigation, and Monitoring*

As discussed in section 3.4.2.1 and section 3.4.3.1, $PM_{2.5}$ is the main cause of visibility impairment from coal mining operations, with secondary impacts from NO_x emissions. Mitigation measures in use to limit emissions of particulate matter are discussed in section

3.4.2.3 and NO_x mitigation measures are discussed in section 3.4.3.3. Additional information is provided in appendix G.

Visibility monitoring in Wyoming consists of both the WDEQ-sponsored Wyoming visibility monitoring network and the IMPROVE program. The WDEQ has placed two visibility-monitoring stations in the PRB. The TBNG site is 32 miles north of Gillette (about 20 miles northeast of the Buckskin Mine) and the Cloud Peak Wilderness Area site (Cloud Peak) is 14 miles west of Buffalo (approximately 84 miles west of Gillette and the Buckskin Mine). Both sites include a variety of sophisticated monitoring equipment, as described in section 3.0 of appendix G. These sites are being used to characterize the extent, frequency of occurrence, and magnitude of impairments to visual air quality.

The IMPROVE steering committee approved the incorporation of the TBNG and Cloud Peak sites into the IMPROVE network in June 2002. Although these stations are not located in Class I areas, the collected data will be comparable to monitoring data available from such areas elsewhere in the state. This information can help scientists determine the types and concentrations of air pollutants and their direction of travel in order to project visibility impacts on Class I areas. The Wyoming visibility monitoring network was recently supplemented with the development of a website at http://www.wyvisnet.com/all.html to allow public access to real-time monitored visibility and air quality conditions (WDEQ 2005a).

3.4.5. Acidification of Lakes

Lake acidification is the change in acid-neutralizing capacity, or the lake's capacity to resist acidification. The acidification of lakes and streams is caused by atmospheric deposition of pollutants (acid rain). According to the EPA, SO_2 and NO_x are the main causes of acid rain (EPA 2009c); both elements are primarily derived from burning fossil fuels. Most lakes and streams have a pH between 6 and 8 (on a scale of 1 to 14), although some lakes are naturally acidic even without the effects of acid rain. Acid rain primarily affects sensitive water bodies located in watersheds whose soils have a limited ability to neutralize acidic compounds (called "buffering capacity"). Lakes and streams become acidic (i.e., pH value goes below 7) when the water itself and its surrounding soil cannot buffer the acid rain enough to neutralize it. In areas where buffering capacity is low, acid rain also releases aluminum from soils into lakes and streams; aluminum is highly toxic to many species of aquatic organisms.

Several regions in the United States were identified in a national surface water survey as containing many of the waters sensitive to acidification. They include the Adirondacks and Catskill mountains in New York, the mid-Appalachian highlands along the east coast, the upper Midwest, and mountainous areas of the western United States.

Scientists predict that the decrease in SO_2 emissions required by a nationwide acid rain program will significantly reduce acidification due to atmospheric sulfur. Without the reductions in SO_2 emissions, the proportions of acidic aquatic ecosystems would remain high or dramatically worsen (EPA 2005b). The USDA Forest Service has been monitoring air quality in the Wind

River Mountain Range in Wyoming since 1984 and is seeing a general trend of decreasing sulfates. In contrast, nitrates have been increasing globally.

3.4.5.1. *Affected Environment*

AQRVs, including the potential air pollutant effects on the acidification of lakes and streams, are applied to PSD Class I and Class II areas. The land management agency responsible for the Class I area in a particular region sets limits of acceptable change for each AQRV. The AQRVs reflect the land management agency's policy and are not legally enforceable standards. Lake acidification is expressed as the change in acid-neutralizing capacity, which represents the lake's capacity to resist acidification from acid rain. This unit of change is measured in microequivalents per liter. Table 3.4-9 shows the existing acid-neutralizing capacity monitored in some mountain lakes in Wyoming and their distance from the general analysis area. For comparison, the USDA Forest Service considers lakes with acid-neutralizing capacity values between 25 and 100 microequivalents per liter to be very sensitive to atmospheric deposition, and lakes with values less than or equal to 25 microequivalents per liter to be extremely sensitive to atmospheric deposition.

Table 3.4-9. Existing Acid-Neutralizing Capacity in Sensitive Lakes

Wilderness Area	Lake	Background Acid-Neutralizing Capacity (µeq/L)	Distance from General Analysis Area (miles)
Bridger	Black Joe	69.0	218
	Deep	61.0	243
	Hobbs	68.0	239
Cloud Peak	Upper Frozen	5.8[a]	82
	Emerald	55.3	89
	Florence	32.7	85
Fitzpatrick	Ross	61.4	250
Popo Agie	Lower Saddlebag	55.5	220

µeq/l = microequivalents per liter

[a] The background acid-neutralizing capacity is based on only six samples taken between 1997 and 2001.

Source: Argonne 2002.

3.4.5.2. *Environmental Consequences*

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and support area (241 acres) would have a minor, short-term impact on lake acidification. Activities in the remainder of the overlap area (474 acres) related to mining existing coal leases also would have a minor, short-term impact on lake acidification.

These levels of impacts on lake acidification are expected because of the distances from the Buckskin Mine to sensitive lakes in the region (table 3.4-9). Production would continue at the

existing average annual rate of 25 million tons, and ongoing sources of impacts on lake acidification would continue as a result of mining the proposed tract. These impacts would not be expected to increase on an annual basis.

Impacts of coal mining on acid deposition are due primarily to NO_x emissions from mining operations, as discussed in section 3.4.3 above. Studies have demonstrated that lake acidification is a regional phenomenon (Dillon et al. 1978). Kiewit has no plans to change its coal production rates or operations, including blasting methods, hauling rates and distances, or other emissions sources. Operations at the Buckskin Mine will continue to employ current control and notification measures for NO_x emissions (outlined in section 3.4.3.3) to minimize the release of emissions into the atmosphere. Modeling for the current Buckskin Mine permit did not forecast any exceedances of the annual particulate or NO_2 NAAQS at the currently permitted production rate of 42 million tons per year that could further contribute to lake acidification; Buckskin's current and anticipated average annual production rates are 25 million tons per year.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected, and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have the same impacts on lake acidification as described under the Proposed Action. As discussed in section 2.2.2, a decision to reject the lease application would not preclude an application to lease a tract in the general analysis area in the future. Production would continue at the existing average annual rate of 25 million tons.

Alternative 2

Under Alternative 2, surface coal mining in the BLM study area (up to 1,883 acres) and support area (926 acres) would have a minor, short-term impact on lake acidification. Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases also would have a minor, short-term impact on lake acidification.

These levels of impacts on lake acidification are expected because of the distances from the Buckskin Mine to sensitive lakes in the region (table 3.4-9). Production would continue at the existing average annual rate of 25 million tons. Ongoing sources of impacts on lake acidification would continue as a result of mining the final tract configuration. These impacts would not be expected to increase on an annual basis.

Kiewit has no plans to change its coal production rates or operations, including blasting methods, hauling rates and distances, or other emissions sources, though the company is committed to working with adjacent landowners to address any concerns that arise. Operations at the Buckskin Mine will continue to employ current control and notification measures for NO_x emissions (outlined in section 3.4.3.3) to minimize the release of emissions into the atmosphere. Modeling for the current Buckskin Mine permit did not forecast any exceedances of the annual particulate or NO_2 NAAQS at the currently permitted production rate of 42 million tons per year

that could further contribute to lake acidification; Buckskin's current and anticipated average annual production rates are 25 million tons.

3.4.6. Regulatory Compliance, Mitigation, and Monitoring

Mitigation and monitoring for coal mine emissions, including the emissions that contribute to the acidification of lakes, are discussed in sections 3.4.2.3, 3.4.2.4, 3.4.3.3, and 3.4.3.4. Other air quality monitoring programs that are in place in the PRB include the Wyoming Air Resources Monitoring System which monitors sulfur and nitrogen concentrations near Buffalo, Sheridan, and Newcastle, and the National Atmospheric Deposition Program, which monitors precipitation chemistry in Newcastle.

3.4.7. Residual Impacts on Air Quality

No residual adverse impacts on air quality would occur following mining and reclamation.

3.5. Water Resources

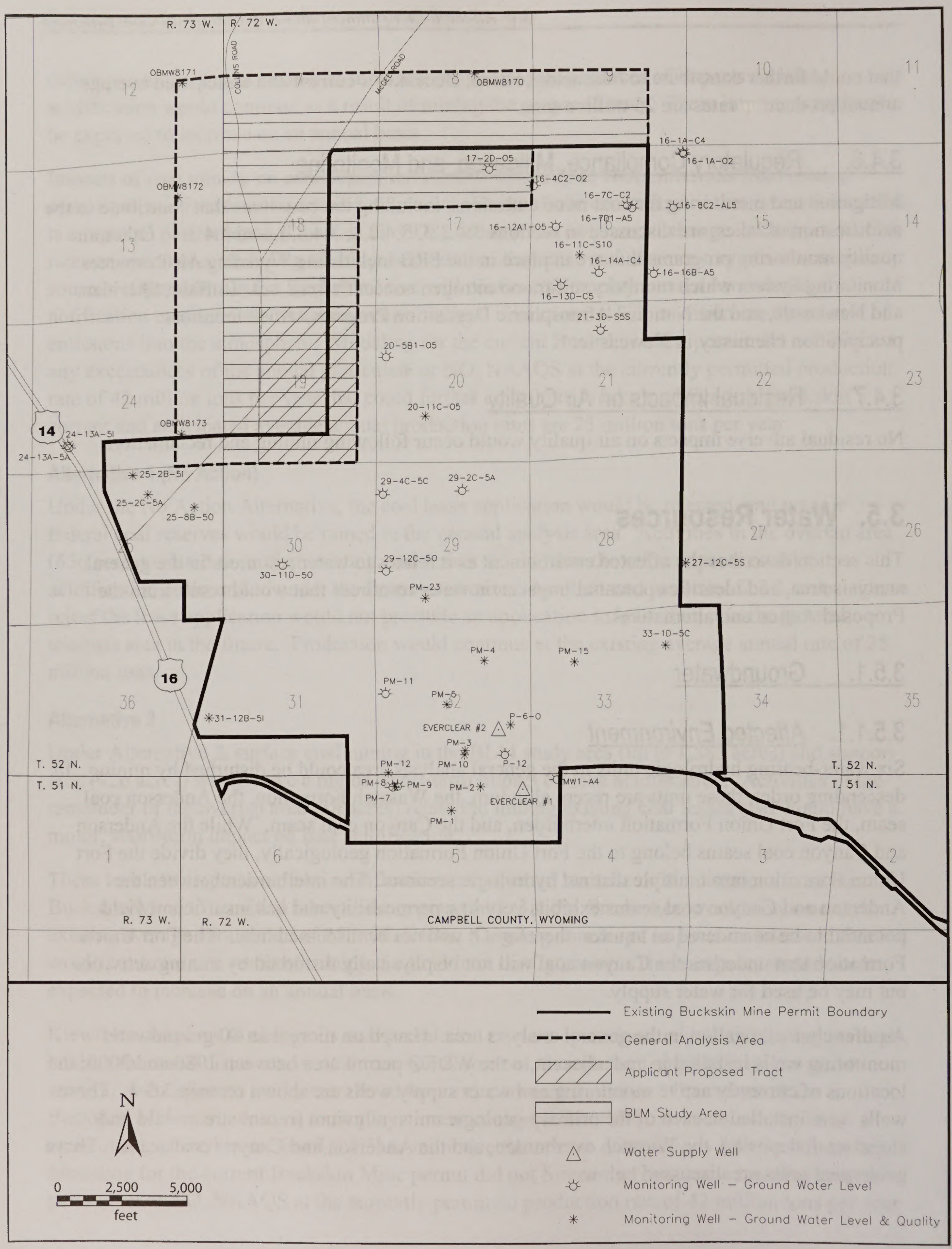
This section describes the affected environment as it relates to water resources in the general analysis area, and identifies potential impacts on water resources that would result from the Proposed Action and alternatives.

3.5.1. Groundwater

3.5.1.1. *Affected Environment*

Six water-bearing hydrologic units in the general analysis area could be disturbed by mining. In descending order, these units are recent alluvium, the Wasatch Formation, the Anderson coal seam, the Fort Union Formation interburden, and the Canyon coal seam. While the Anderson and Canyon coal seams belong to the Fort Union Formation geologically, they divide the Fort Union Formation into multiple distinct hydrologic sections. The interburden between the Anderson and Canyon coal seams exhibits very low permeability and has insufficient yield potential to be considered an aquifer; therefore, it will not be discussed here. The Fort Union Formation that underlies the Canyon coal will not be physically disturbed by mining activities but may be used for water supply.

Aquifer characterization in the general analysis area is based on more than 80 groundwater monitoring wells installed in and adjacent to the WDEQ permit area between 1980 and 2000; the locations of currently active monitoring and water supply wells are shown on map 3.5-1. These wells were installed in each of the primary geologic units: alluvium (recent stream-laid and slope-wash deposits), the Wasatch overburden, and the Anderson and Canyon coal seams. These geological units are discussed below.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 3.5-1

Currently Active Groundwater Monitoring and Water Supply Wells at Buckskin Mine

Recent Alluvium

Groundwater in recent alluvium (sediments deposited by water flow) occurs primarily near and along the valley and draw bottoms associated with Hay Creek. It is directly connected to and recharged by groundwater in adjacent clinker and the Wasatch overburden. Alluvial groundwater flow generally follows topography, flowing out of upland areas into the valley and draw bottoms, then down-valley along the Hay Creek drainage. Hydraulic gradients are similar to the topographic and valley-bottom slopes on which the deposits reside.

Aquifer testing indicates that the hydraulic conductivity, the capacity to transmit water, of stream-laid deposits along the Hay Creek valley bottom ranges from about 0.40 to 230 feet per day. Deposits in the general analysis area are finer-grained compared to those downstream, and exhibit hydraulic conductivities in the lower range.

Although not alluvium, clinker is considered recent and can be an important groundwater resource. Recent testing and mine dewatering of the clinker near the Hay Creek valley bottom indicates hydraulic conductivities that may exceed 2,000 feet per day. Such high values are common for clinker along the coal outcrops in the PRB.

Groundwater quality in the alluvial deposits is poor, and is generally unsuitable for domestic, agricultural, and livestock uses as defined by the Wyoming groundwater classification suitability criteria (WDEQ 2005b). Total dissolved solids (TDS), the measure of dissolved salts in water and an overall measure of water quality, is relatively high in the Hay Creek alluvium with an average of about 4,500 milligrams per liter. Isolated areas exhibit higher TDS concentrations because of surface water reservoirs that concentrate salts and locally affect alluvial groundwater. Sulfate, which contributes to the overall TDS, is generally high in the alluvium, roughly 10 times the suitability criteria limit.

Wasatch Formation

The principal groundwater occurrence in the Wasatch Formation is in sandstones that can be traced laterally for considerable distances. Aquifer testing of Wasatch sands indicates relatively low hydraulic conductivities that range from less than 1 to about 13 feet per day, with the highest values associated with surface sands that are commonly eolian in origin. These surface sands are the primary contributors of groundwater to the Hay Creek valley alluvium.

Wasatch groundwater generally follows topography, flowing northeast from the upland areas and discharging into the Hay Creek valley and to the limited clinker deposits in sections 16 and 21. Seeps (groundwater emanating at grade over a broad area) occur in some upland areas where groundwater in the sandstones is near grade, especially in draws.

Groundwater in the Wasatch sandstones is generally better quality when compared to other aquifer units, with an average TDS concentration of about 2,500 milligrams per liter. Overburden groundwater quality meets suitability criteria for livestock, but exceeds TDS and sulfate limits for domestic and irrigation uses.

Anderson and Canyon Coals

The most extensive aquifer units in the general analysis area are the Canyon and Anderson coal seams. The aquifers are defined by the top and bottom of the seam, and are commonly confined by shale, silt, or clay. However, in some areas, groundwater in both seams may also occur in unconfined conditions and may even be unsaturated.

Hydraulic conductivities in the coal seams are generally low and exhibit a range of about 0.0020 to 2.0 feet per day. The variation is due to the degree to which the coal is fractured or its location relative to grade, which controls the degree of weathering.

Measurements taken in the 1980s showed that groundwater flow in the Anderson coal seam was primarily to the east and northeast from upland areas toward discharge zones in the Hay Creek valley. In 2000, some groundwater in the Anderson coal seam was found to flow from east to west. Although some changes in groundwater flow patterns are a result of mine dewatering, changes can also be attributed to CBNG operations west of the general analysis area that began in the mid 1990s.

Based on measurements taken in the 1980s, groundwater flow in the Canyon coal seam was similar to that of the Anderson coal seam (primarily to the northeast). In 2000, flows changed direction from east to west. As with the Anderson coal, in addition to mine dewatering, CBNG activities have contributed to the changes in groundwater flow patterns in the Canyon coal (Hydro-Engineering 2007).

Water quality in the Anderson and Canyon coal seams exhibits considerable variation depending on the concentrations of major dissolved constituents, and is dominated by calcium, magnesium, and sulfate. Groundwater in the overburden affects water quality in the coals. CBNG drawdown may further affect water quality by creating induced hydraulic gradients in the coals. Coal groundwater, where present and still unaffected by mining or CBNG, is suitable for livestock use in some areas. In other areas, it is unsuitable for livestock or irrigation use because of elevated dissolved constituents or sodium adsorption ratio, a measure of the effect of sodium on soils. Elevated ammonia is consistent in both coal seams where bicarbonate dominates the anionic species, a phenomenon typical for coal groundwater in general.

Subcoal Fort Union Formation

The target coal seams in the general analysis area occur within the uppermost portion of the Tongue River member of the Fort Union Formation. The underlying Lebo and Tullock members consist of lithologies similar to that of the Tongue River, with sandstone predominating the Tullock and shale predominating the Lebo. The Lebo is commonly a confining unit between the Tongue River and Tullock members.

The Tullock aquifer commonly exhibits transmissivity - the rate at which water is transmitted through an aquifer - that is higher than that of the Tongue River aquifer. This makes it a common water supply. The average transmissivity for this member as reported by the OSM (1984) is 290 square feet per day (2,200 gallons per day per foot).

The Buckskin Mine uses two water supply wells completed in the Tullock aquifer south of the general analysis area (map 3.5-1). These wells supply water for both mining operations and on-site domestic use.

3.5.1.2. *Environmental Consequences*

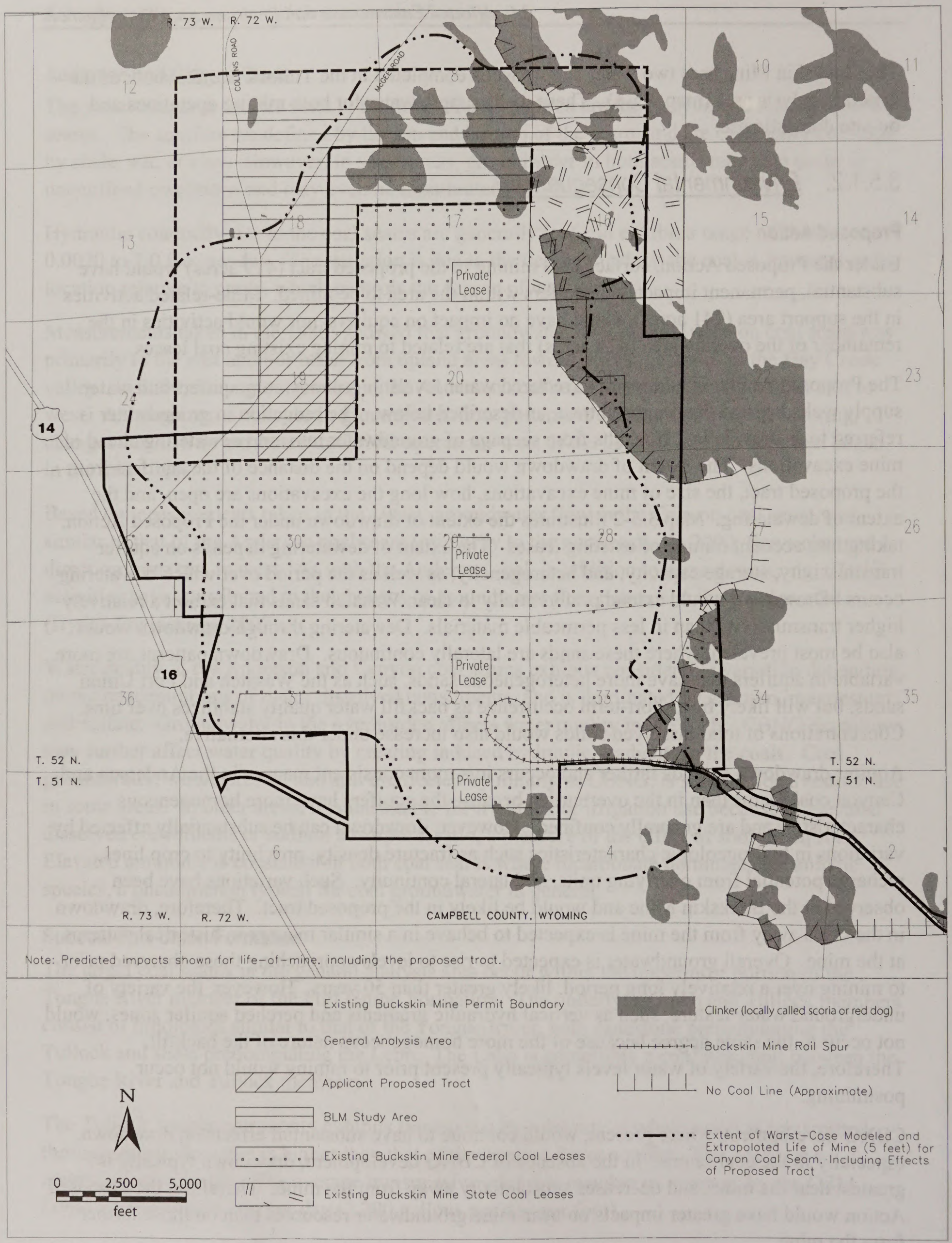
Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) would have substantial, permanent impacts on aquifers within the area to be mined. Mine-related activities in the support area (241 acres) would have no impact on aquifers, nor would activities in the remainder of the overlap area (474 acres) that are related to mining existing coal leases.

The Proposed Action would result in reduced water levels in groundwater aquifers and water supply wells beyond the proposed tract, as described below. The reduction in groundwater is referred to as drawdown. It results from seepage of groundwater into, and dewatering ahead of, mine excavations. The extent of drawdown would depend on the distance of the aquifers from the proposed tract, the size of mine excavations, how long the excavations are open, and the extent of dewatering. Map 3.5-2 illustrates the extent of drawdown under the Proposed Action, taking into account mining of existing leases. The extent of dewatering depends on aquifer transmissivity, storage capacity, and heterogeneity, as well as the period over which dewatering occurs. Drawdown would extend preferentially in clean Wasatch sands that exhibit a relatively higher transmissivity than in less permeable materials. Dewatering through drawdown would also be most prevalent where these sands are laterally continuous. Drawdown patterns are more variable in aquifers that have more heterogeneous sands, such as the Wasatch and Fort Union sands, but will likely be a short-term occurrence as backfill water quality stabilizes over time. Concentrations of total dissolved solids would also increase under this alternative.

Aquifer drawdown extends farther and occurs in a more consistent manner in the Anderson and Canyon coal seams than in the overburden because the aquifers have more homogeneous characteristics and are generally confined. However, drawdown can be substantially affected by variations in hydrogeologic characteristics such as fracture density, proximity to crop lines, recharge potential from overlying units, and lateral continuity. Such variations have been observed at the Buckskin Mine and would be likely in the proposed tract. Therefore, drawdown in the coals away from the mine is expected to behave in a similar manner to historical patterns at the mine. Overall groundwater is expected to rise to levels approaching those observed prior to mining over a relatively long period, likely greater than 50 years. However, the variety of underground water feature, such as vertical hydraulic gradients and perched aquifer zones, would not occur to the same degree because of the more homogeneous nature of the backfill. Therefore, the variety of water levels typically present prior to mining would not occur postmining.

CBNG development, where present, would continue to have substantial effects on drawdown, especially in the coal seams. In the absence of CBNG development, drawdown typically is greatest near the mine, and decreases substantially away from the mine. Therefore, the Proposed Action would have greater impacts on near-mine groundwater resources than on those farther from the mine.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 3.5-2

Extent of Drawdown under Proposed Action

Two water supply wells from the underburden aquifer are currently used by the Buckskin Mine. Although the evaluation of adequate water supply is ongoing as mining progresses, the mine may not require additional underburden water supply wells to mine the proposed tract. Due to its proximity to the existing Buckskin Mine, groundwater quality in the backfill aquifer on the proposed tract is expected to be similar to that measured in existing wells completed in the backfill at the mine. Variations in water quality may occur because of differences in the proportions of materials (i.e., sands, silts, and clays) used to reclaim the aquifer.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area related to mining existing leases would have no impact on groundwater. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) would have substantial, permanent impacts on aquifers within the area to be mined. Mine-related activities in the support area (926 acres) would have no impact on aquifers, nor would activities in the remainder of the overlap area (38 acres) that are related to mining existing coal leases.

Long-term groundwater reduction in near-mine aquifers west of the BLM study area would extend farther than under the Proposed Action. Based on monitoring results to date, the two water supply wells currently in use could remain viable through the life of the mine. Groundwater quality in the backfill aquifer in the general analysis area is expected to be similar to that measured in existing wells completed in the backfill at the mine.

3.5.1.3. *Regulatory Compliance, Mitigation, and Monitoring*

If one of the action alternatives is implemented, Kiewit will complete baseline studies regarding regional and site-specific hydrogeologic characteristics to account for additional permitted area. As part of the baseline hydrogeologic studies for the existing permit area, Kiewit has installed monitoring wells in the alluvium, overburden, interburden, coals, and underburden to evaluate impacts on groundwater from mining activities. Also installed as part of the mining permit reclamation plan are backfill monitoring wells to evaluate groundwater of mine spoils as they re-saturate. If one of the action alternatives is implemented, Kiewit will expand these monitoring programs to address additional lease area as well as reclaimed areas on existing leases and will document groundwater monitoring in the mining permit amendment as well as in annual reports submitted to the WDEQ.

3.5.2. Surface Water

3.5.2.1. *Affected Environment*

Surface Water Characteristics

The most prominent surface water feature in the general analysis area is Hay Creek (map 3.5-3). Hay Creek topographically originates northwest of the general analysis area, in the NW4 of section 7, and then flows into the area and through section 18. The creek has been mined out in the central and southern portions of section 17, and is diverted to rejoin the undisturbed creek in the western half of section 16. Hay Creek is considered a minor stream in the regional drainage network of the Little Powder River. According to chapter 1, section 4 of the WDEQ Rules and

Regulations, Hay Creek, although unclassified, would be characterized as a class 4 stream having intermittent or ephemeral flow that is protected for agricultural uses and wildlife watering.

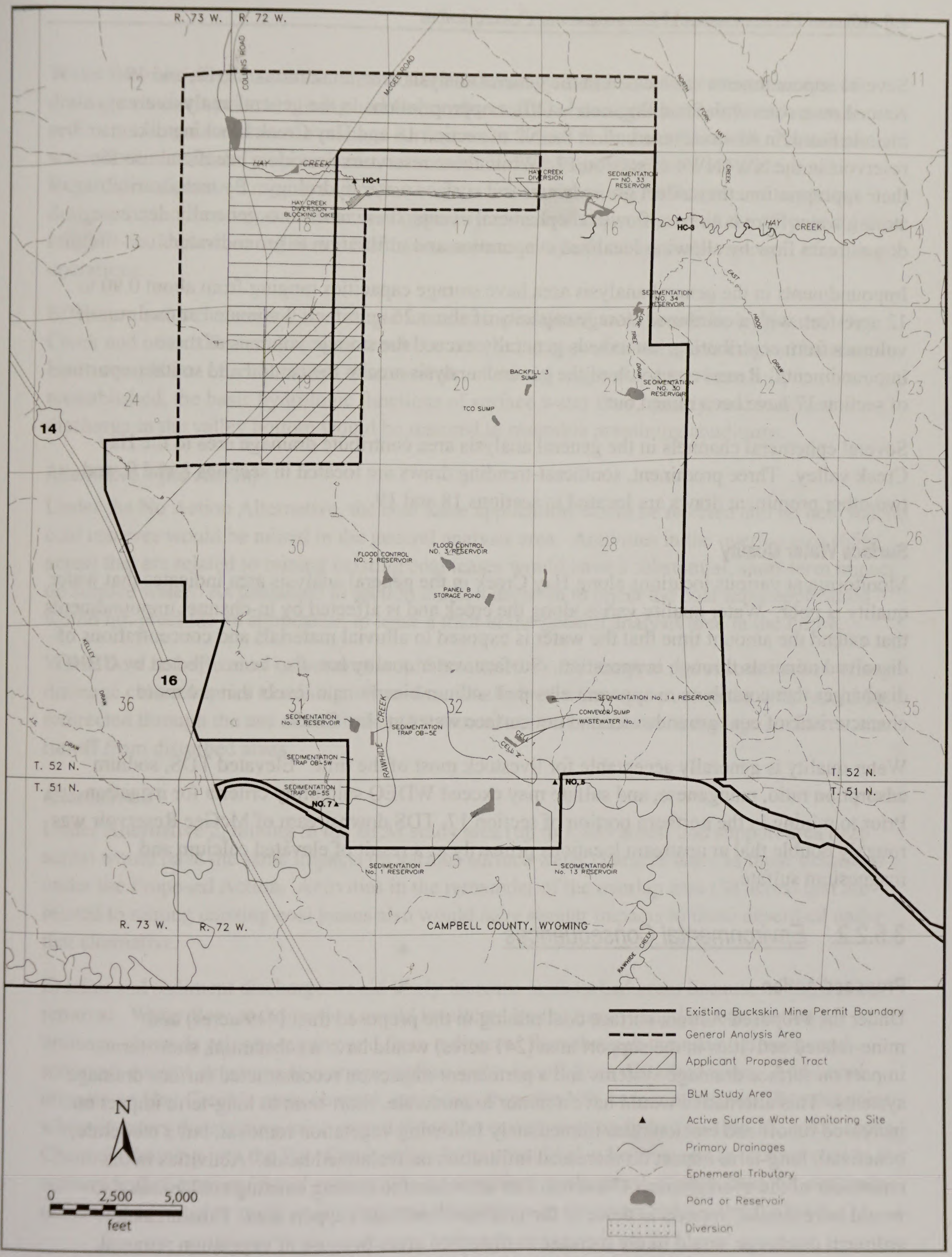
The creek is ephemeral in nature (i.e., responds only to rainfall or snow-melt events) as it enters the general analysis area in the SW4 of section 7. Down-valley of this location the valley bottom flattens, and Hay Creek is a poorly defined, ephemeral channel. Downstream of its undisturbed location in section 16, the creek varies between intermittent (i.e., flows for less than half of the year) and ephemeral as it courses eastward along a well-defined channel.

At its confluence with the Little Powder River, about 2 miles east of the general analysis area, Hay Creek drains 15 square miles. The channel elevation drops about 34 feet over a channel length of 8,100 feet across the area, equating to an average channel slope of 0.0042.

Hay Creek monitoring has been conducted since 1999 in the general analysis area in the NE4NE4 of section 18, and east of the area in the SE4NE4 of section 16. Monitoring has included both continuous flow measurements and periodic water quality sampling.

Monitoring at both stations indicates that Hay Creek varies from dry to average base flows (flows that occur from normal contributions of groundwater) on the order of less than 1 cubic foot per second (cfs). Response to intense rainfall events may elevate the flow temporarily. CBNG well discharges have also affected stream flow in Hay Creek, resulting in fairly consistent but unnatural flows.

Estimated runoff in the general analysis area, based on quantitative modeling, is 2.7 cfs for a 10-year, 6-hour storm and 17 cfs for a 2-year, 24-hour storm. These estimates ignore the retarding effects of watershed impoundments on flow rates, so they represent maximum estimated runoff values. The runoff from the 2-year event is agriculturally significant because such a storm has an equal chance of occurring in any given year, and thus can be important for natural flood irrigation.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 3.5-3

Surface Water Features in the General Analysis Area

Several impoundments are located in the general analysis area, in sections 17, 18, and 19. Named reservoirs with State Engineer's Office appropriations in the general analysis area include Franklin #1 stock reservoir in the N2 of section 18 and Hay Creek blocking dike reservoir in the NW4NW4 of section 17. While these reservoirs provide a beneficial use for their appropriation, they affect groundwater and surface water hydrology. By temporarily storing water from both base flow and ephemeral events, these reservoirs generally decrease downstream flow by allowing localized evaporation and infiltration to groundwater.

Impoundments in the general analysis area have storage capacities ranging from about 0.90 to 12 acre-feet, with a combined storage capacity of about 26 acre-feet. Estimated annual runoff volumes from contributing watersheds generally exceed the storage volumes of these impoundments. Reservoirs south of the general analysis area in the central and southern portions of section 17 have been mined out.

Several ephemeral channels in the general analysis area contribute drainage area to the Hay Creek valley. Three prominent, southeast-trending draws are located in sections 8 and 9, and two other prominent draws are located in sections 18 and 19.

Surface Water Quality

Monitoring at various locations along Hay Creek in the general analysis area indicates that water quality is poor. Water quality varies along the creek and is affected by in-channel impoundments that extend the amount time that the water is exposed to alluvial materials and concentrations of dissolved minerals through evaporation. Surface water quality has also been affected by CBNG discharges that contribute to apparent elevated sodium bicarbonate levels that are more characteristic of coal groundwater and not surface water in Hay Creek.

Water quality is generally acceptable for livestock most of the time. Elevated TDS, sodium adsorption ratio, manganese, and sulfate may exceed WDEQ suitability criteria for irrigation. Prior to mining in the northern portion of section 17, TDS downstream of McGee Reservoir was roughly double that at upstream locations primarily as a result of elevated calcium and magnesium sulfate.

3.5.2.2. *Environmental Consequences*

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mine-related activities in the support area (241 acres) would have a substantial, short-term impact on surface drainage systems and a permanent impact on reconstructed surface drainage systems. This alternative would have a minor to moderate, short-term to long-term impact on increased runoff and erosion rates immediately following vegetation removal, but a moderate, beneficial, long-term impact on increased infiltration on reclaimed lands. Activities in the remainder of the overlap area (474 acres) that are related to mining existing coal leases also would have similar impacts to those in the proposed tract and support area. Erosion and sediment discharge would likely increase in disturbed areas because of vegetation removal.

Water flow and direction in that area would be altered by the removal and reconstruction of drainage channels prior to mining and from redirected flow through the use of erosion- and sediment-control structures to manage surface water runoff from disturbed areas. No connected water bodies cross the proposed tract, so no additional channel diversions are anticipated. Regardless of planned mining and reclamation activities, large storms that exceed capacity designs for sediment-control structures (typically a storm that would exceed the 10-year, 24-hour rainfall) could produce sediments that have temporary impacts on areas downstream of mining operations.

Effects on soil structure and hydrologic function in reclaimed areas would be long-term. Hay Creek and other affected drainages would be restored in approximately their original locations. Upon completion of reclamation, when soil structure and vegetation have been fully reestablished, the basic hydrologic functions of surface water flow, quality, and sediment discharge in the valley bottom would be restored to resemble premining conditions.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) that are related to mining existing coal leases would have a substantial, short-term impact on surface water. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Water flow and direction in that area would be altered by the removal and reconstruction of any drainage channels prior to mining. Flow from the limited water resources in the area would be redirected through the use of erosion- and sediment-control structures to manage surface water runoff from disturbed areas.

Alternative 2

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) and support area (926 acres) would have the same impacts on various surface water characteristics as those described under the Proposed Action. Activities in the remainder of the overlap area (38 acres) that are related to mining existing coal leases also would have similar impacts to those described under that alternative,

Erosion and sediment discharge would likely increase in disturbed areas because of vegetation removal. Water flow and direction would be altered by the removal and reconstruction of drainage channels prior to mining and from redirected flow through the use of erosion- and sediment-control structures to manage surface water runoff from disturbed areas. Additional impacts on Hay Creek's main channel, extending from the NW corner of section 18 to the point where it enters the existing mine permit along the eastern section line of section 18, could occur. Channels draining into the Hay Creek valley bottom could also be removed to recover coal in the western half of section 18 and section 19. As described in chapter 2, Kiewit does not anticipate relocating any county roads or causing new disturbance in the operationally limited lands

between the two roads. Consequently, Kiewit does not anticipate the construction of any further diversions on Hay Creek west of the current permit boundary.

3.5.2.3. *Regulatory Compliance, Mitigation, and Monitoring*

If one of the action alternatives is implemented, Hay Creek and major channels will be restored after completion of mining operations, in accordance with SMCRA and Article 4 of the Wyoming Environmental Quality Act.

Other permit requirements outlined in chapter 4 section 2(e) of the WDEQ Rules and Regulations include constructing sediment-control structures to manage and treat surface water discharges from disturbed areas and restoring reservoirs and playas disturbed during mining. Reservoirs in sections 17, 18, and 19 would be reconstructed and replaced in the approximate premining locations. Surface water quantity and quality in the restored Hay Creek channel would be monitored periodically per WDEQ requirements.

3.5.3. Water Rights

3.5.3.1. *Affected Environment*

The State Engineer's Office administers water rights in Wyoming, which are granted for both groundwater and surface water. Their records indicate that, as of May 2008, 2,380 permits for groundwater rights are within 3 miles of the general analysis area, 1,166 of which are for non-coal applicants. Groundwater rights for non-coal applicants are listed in appendix H. The breakdown of groundwater rights is as follows:

- 324 stock, CBNG;
- 152 CBNG;
- 156 miscellaneous;
- 101 monitoring;
- 96 stock, miscellaneous, CBNG;
- 71 miscellaneous, stock;
- 73 stock;
- 64 temporary filings;
- 60 domestic, stock;
- 38 domestic;
- 19 CBNG, reservoir supply, miscellaneous;
- 8 stock, miscellaneous;
- 2 industrial;

- 1 domestic, miscellaneous; and
- 1 irrigation.

State Engineer's Office records indicate that, as of May 2008, 368 permits for surface water rights are within 3 miles of the general analysis area, 308 of which are for non-coal applicants. Surface water rights for non-coal applicants are listed in appendix H. The breakdown of surface water rights is as follows:

Adjudicated (129 total):

- 71 irrigation;
- 26 miscellaneous ;
- 20 stock;
- 9 irrigation, domestic; and
- 3 irrigation, reservoir supply.

Un-adjudicated (179 total):

- 106 stock;
- 32 irrigation;
- 15 irrigation, reservoir supply;
- 13 oil refining/production, temporary use, industrial, drilling;
- 6 irrigation, domestic;
- 5 industrial; and
- 2 stock, domestic.

3.5.3.2. *Environmental Consequences*

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) would have a moderate, long-term impact on groundwater wells; mine-related activities in the support area (241 acres) would have a minor, long-term impact on one surface water right. Activities in the remainder of the overlap area (474 acres) that are related to mining existing coal leases would have no impact on water rights.

Groundwater rights associated with existing water supply wells would experience impacts from the removal of aquifers in the proposed tract as a result of mining. Additionally, mine dewatering would affect existing wells near the proposed tract in the Wasatch or Fort Union formations above the Canyon coal seam; wells below the Canyon coal seam would not be affected.

Additional impacts on groundwater rights from CBNG development would continue. Impacts on water supply wells completed in the same coals where CBNG development is occurring may be affected as well as other wells that have hydraulic connections to these coals. The extent of impacts on these wells by CBNG development depends on how close they are to the CBNG extraction wells, the length of time groundwater withdrawals occur, and the hydraulic connection to aquifers from which CBNG groundwater withdrawals are occurring.

One surface water right associated with the small tributary to Hay Creek would be removed during mining. Mining activities would also affect surface water rights down-slope of the general analysis area as a result of significantly altered hydraulic characteristics of the Hay Creek valley and its associated draws. Potential impacts include a reduction of surface water flow and a change in surface water quality from mining-related sediment discharges. Surface water rights up-slope of the general analysis area would not be affected.

Alternative 1 (No Action)

Under No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) that are related to mining existing coal leases would have no impact on water rights. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Impacts on downstream surface water rights would be related to the previous diversion of a portion of Hay Creek from the northern half of section 17, as well as surrounding ephemeral draws. No new impacts on groundwater or surface water rights would occur due to the nature of mine-related support activities in the overlap area associated with existing coal leases. Impacts related to CBNG development could affect water rights in the overlap area.

Alternative 2

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) would have a moderate, long-term impact on groundwater wells, while mine-related activities in the support area (926 acres) would have a minor, long-term impact on up to two surface water rights. Activities in the remainder of the overlap area (38 acres) that are related to mining existing coal leases would have no impact on water rights.

Additional groundwater rights could be removed, and dewatering impacts on groundwater rights could extend farther to the west. One additional surface water right in the western half of section 18 could be removed; an additional reach of Hay Creek in the northwestern corner of section 18 could be removed; and channels that lead to the Hay Creek valley bottom could be removed to recover coal in the western half of sections 18 and 19. The latter two impacts are not expected because Kiewit does not anticipate relocating any county roads or causing any new disturbance on the operationally limited lands between the roads.

3.5.3.3. Regulatory Compliance, Mitigation, and Monitoring

SMCRA and Wyoming state statutes (Title 41—Water) govern the protection of groundwater and surface water rights. Mine operators are required to provide the owner of a water right whose water source is interrupted, discontinued, or diminished by mining with water of equivalent quantity and quality.

If one of the action alternatives is implemented, Kiewit will update the list of private water supply wells that could be affected by mining and predict impacts on those wells as part of the WDEQ permitting process. Kiewit will commit to replacing those water supplies affected by mining with water of equivalent quality and quantity. Kiewit will reconstruct Hay Creek, surrounding channels, and reservoirs to restore surface water rights affected by mining. The permit reclamation plan must specify reconstruction methods to restore surface water features similar to those characterized prior to mining. Periodic monitoring of surface water flows and quality will be required ensure that flows and water quality are similar to premining conditions.

Adjacent landowners to the north of the Buckskin Mine have contacted and met with mine personnel regarding their concerns about the impacts of mining on their water wells. The landowners and mine representatives are actively working to resolve those issues.

3.5.4. Residual Impacts

The action alternatives would have minor to moderate, long-term impacts on groundwater quantity as a result of removing aquifers and extracting groundwater. Although groundwater quantity would begin to recover once the backfill is replaced and the aquifer recharge begins, full recovery of groundwater levels in and adjacent to the general analysis area could extend well beyond the life of mine. The action alternatives would have permanent impacts on groundwater elevations (i.e., water table depths) related to perching (underground benches that can trap water), geologic layering (affecting underground water flow), or heterogeneity (affecting permeability).

Groundwater quality is expected to return to premining conditions—adequate for livestock use—though it may exhibit slight but permanent variations related to the nature of the backfill.

Because of the ephemeral nature of Hay Creek in the general analysis area, the action alternatives would have no residual impacts on surface water. Successful reclamation would ensure that rainfall would be adequately conveyed through reclaimed channels and stored in reclaimed reservoirs.

3.6. Alluvial Valley Floors

This section discusses the affected environment as it relates to alluvial valley floors (AVFs) in the general analysis area and the adjacent Buckskin Mine permit area and identifies any impacts on AVFs that would result from the Proposed Action and alternatives.

Prior to leasing and mining, AVFs must be identified because, under the SMCRA, mining on AVFs is prohibited unless the affected AVF is undeveloped rangeland that is insignificant to farming or is of such small acreage that it would have a negligible impact on a farm's agricultural production. These restrictions also apply to AVFs that are downstream of mining but might be affected by streamflow or groundwater impacts. AVFs not significant to agriculture can be disturbed during mining but must be restored as part of the reclamation process.

3.6.1. Affected Environment

Hay Creek is ephemeral in nature (i.e., it responds only to rainfall or snowmelt events) as it enters the general analysis area in the SW4SW4 of section 7 and flows to the east. Down-valley of this location the creek bottom flattens a poorly defined channel throughout the remainder of the general analysis area. Section 3.5 describes various aspects of the Hay Creek drainage, including its physical characteristics, potential for flood irrigation, and apparent subirrigated areas, among other features. In alluvial valley floors, subirrigation refers to the supplying of water to plants from underneath, or from a semi-saturated or saturated subsurface zone where water is available for use by vegetation (30 CFR 701.5).

WDEQ Rules and Regulations define AVFs as unconsolidated stream-laid deposits where water is available in sufficient quantities for agricultural activities (30 CFR 701.5). OSM and WDEQ have established guidelines to identify AVFs. These guidelines require detailed studies of geomorphology, soils, hydrology, vegetation, and land use, and are used to identify the following elements:

- presence of unconsolidated stream-laid deposits,
- potential for flood irrigation practices,
- evidence of past or present flood irrigation, and
- apparent subirrigated areas and the potential for natural flood irrigation.

Areas identified as AVFs following these studies are evaluated for their significance to farming by the WDEQ.

The WDEQ has not identified the agricultural productivity of the Hay Creek valley floor as significant to farming. Moreover, interviews with landowners and lessees who have agricultural operations in the Hay Creek valley floor consistently described failed or no attempts to develop artificial flood irrigation along Hay Creek (Buckskin Mining Company 2000).

3.6.1.1. *Studies Conducted to Determine Presence of Alluvial Valley Floors*

The primary AVF investigation in the general analysis area was completed in 2000. Investigations specific to section 16, east of that area, were completed by Triton Coal Company between 1980 and 1982, and the results from these investigations were incorporated into the

2000 investigation. These AVF studies were conducted as part of the WDEQ mine permitting process to recover coal under Buckskin Mine's existing leases.

These investigations initially concluded that the Hay Creek valley bottom (including the portion that passes through the general analysis area) is not an AVF, as defined by WDEQ. That agency challenged this conclusion and determined that a portion of the Hay Creek valley floor is an AVF. The Wyoming Environmental Quality Council overturned this determination and upheld the original conclusion that the valley floor is not an AVF. A copy of the Environmental Quality Council order is included in appendix I.

The findings of the investigations are described below.

Presence of Unconsolidated Stream-Laid Deposits

No stream-laid deposits are present in the general analysis area. Stream-laid deposits do occur in portions of the Hay Creek valley bottom and some associated upland draws beyond the general analysis area. Those areas consist of sand, gravel, and silt deposited by streamflow within Hay Creek and its tributaries. Prior to mining through the creek channel in the northern portion of section 17, mapped stream-laid deposits down-valley of the general analysis area occupied about 57 acres on the creek bed. These deposits typically varied from about 80 to 500 feet wide, and were about 20 feet thick. Stream-laid deposits terminate before entering the reservoir in the general analysis area in the SW4NW4 of section 17. Upstream of that reservoir in the general analysis area, the valley-bottom deposits consist of slope wash overlying bedrock. Slope wash occurs along the bottom slopes of hills and in channel bottoms, including the Hay Creek valley bottom in section 18, and consists of reworked sediment deposited by overland flow. These are not fluvial (stream-laid) deposits associated with Hay Creek.

Potential for Flood Irrigation

Runoff from the 2-year, 24-hour storm event, generally considered agriculturally useful, yields about 11 acre-feet of water in the vicinity of the Buckskin Mine. This runoff volume is small relative to the cumulative storage capacity of reservoirs in the valley bottom and would not be sufficient to support any reliable flood irrigation practices.

Poor surface water and groundwater quality in Hay Creek and its alluvium, respectively, would make it generally unsuitable for domestic, agricultural, and livestock uses. The poor groundwater quality is attributed to the effect of reservoirs that locally concentrate salts and to natural groundwater quality characteristics of adjacent deposits that recharge the alluvium. Water quality is discussed in detail in section 3.5.

Groundwater quality in the Hay Creek alluvium is poor, and is generally unsuitable for domestic, agricultural, and livestock uses. Sulfate, which contributes to the overall TDS, is generally high in the alluvium, roughly ten times the suitability criteria limits. The poor groundwater quality is attributed to the effect of reservoirs that locally concentrate salts and to natural groundwater quality characteristics of adjacent deposits that recharge the alluvium.

The agriculturally useful flood is of insufficient volume to support any reliable flood irrigation practices. Runoff from the 2-year, 24-hour storm event, which is generally considered to be of agricultural use, yields about 11 acre-feet of water. This runoff volume is small relative to the cumulative storage capacity of reservoirs in the valley bottom and will not produce a flood that is useful for irrigation.

Soils in the valley bottom also are of poor quality and are not suitable for irrigation purposes. Elevated electrical conductivity, boron, and selenium make the soils along Hay Creek unsuitable for irrigated row crops or improved pasture. The elevated electrical conductivity results in less water being available to plants because of osmotic potentials that exceed the capability of the plant to extract water from the soil. Boron toxicity may result in slowed growth and reduced production. Toxic concentrations of selenium may result in selenosis in livestock.

Evidence of Flood Irrigation and Subirrigated Areas

Plant species of agricultural interest have developed voluntarily in the native rangelands of the Hay Creek valley floor without any evidence that they were intentionally introduced for range improvement practices. Plant communities in the general analysis area that require flood irrigation are limited to the channel bottom along Hay Creek. Subirrigated vegetation occurs along and in the Hay Creek channel, adjacent to the channel in specific areas, and in isolated locations in upland areas. No evidence exists to indicate that these subirrigated plant species were specifically developed to exploit natural subirrigation.

3.6.2. Environmental Consequences

3.6.2.1. *Proposed Action*

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mine-related activities in the support area (241 acres) would have no impact on AVFs. Activities in the remainder of the overlap area (474 acres) that are related to mining existing coal leases also would have no impact on AVFs.

No AVFs are present in the proposed tract or support area, or in the remainder of the overlap area. No primary drainages occur in any of those areas. One isolated, ephemeral draw crosses the northwestern corner of the proposed tract and support area, but it does not connect with Hay Creek or any other drainage and, therefore, does not include AVFs.

As described in section 3.5, groundwater intercepted by dewatering activities would be routed through settling ponds to meet state and federal water quality criteria. Dewatering the alluvium in the proposed tract would not affect off-site alluvial groundwater downstream of the tract because no alluvium is present there and because the closed drainage in the area cannot contribute flow or alluvium to other systems. Dewatering could indirectly affect off-site alluvial groundwater up-valley of the proposed tract by creating a zone of influence (drainage area) that could extend beyond the tract boundary.

3.6.2.2. Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) that are related to mining existing coal leases would have no impact on AVFs. As discussed in section 2.2.2, a decision to reject the lease application would not preclude an application to lease a tract in the general analysis area the future.

No AVFs have been identified in the overlap area. The majority of the portion of the Hay Creek channel that flows through that area has already been diverted as part of previously permitted mining activities, and Kiewit does not anticipate diverting any additional sections of that creek.

3.6.2.3. Alternative 2

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) and support area (926 acres) would have no impact on AVFs. Activities in the remainder of the overlap area (38 acres) that are related to mining existing coal leases also would have no impact on AVFs.

No AVFs are present in the BLM study area and support area, or in the remainder of the overlap area, including the Hay Creek channel and floodplain. Mining could remove additional portions of the Hay Creek valley floor and associated features in the northern half of section 18 and the southwestern corner of the northwestern quarter of section 17. Kiewit does not anticipate any further diversions on Hay Creek, and has constructed a blocking dike at the western end of the current diversion to channel streamflow from the natural drainage into the existing structure. Indirect impacts (potential dewatering of alluvium) upstream of mine operations would be the same as those described for the Proposed Action, but could extend over a larger area.

The Buckskin Mine has constructed a diversion for the valley floor that has been mined out in section 17. As mining approaches the valley floor in section 18, dewatering activities would deplete alluvial groundwater in the valley. Mining would subsequently progress across the valley floor and remove the alluvium. Stream diversions could be constructed to ensure that instream flows are preserved while mining progresses across the valley floor, though no additional diversions are expected to be constructed at this time.

Groundwater intercepted by dewatering activities would be routed through settling ponds to meet state and federal water quality criteria. If additional diversions are constructed, discharges from these ponds would potentially increase the frequency and amount of flow in Hay Creek downstream of mining activities, thereby increasing surface water supplies outside the general analysis area to the east. Dewatering the alluvium in the final tract configuration would have no direct impact on off-site alluvial groundwater downstream of the tract because the alluvium in section 17 has already been removed. Dewatering could indirectly affect off-site alluvial groundwater up-valley of the tract by creating a zone of influence (drainage area) that could extend up-valley and northwest of the tract.

3.6.3. Regulatory Compliance, Mitigation, and Monitoring

Chapter 5 of the WDEQ Rules and Regulations and SMCRA both address AVFs. If either of the action alternatives is implemented, the following mitigation and monitoring will be required.

Basic surface water functions in Hay Creek will be restored during reclamation to ensure that water can be conveyed from the upstream, undisturbed point on the creek channel to the downstream tie-in point east of the general analysis area. The portion of the channel that will pass through reclamation will be constructed to simulate the characteristics of the premining native channel. Consideration will be given to erosional stability and to the reconstruction of ephemeral channels that would lead into the reclaimed valley floor. Surface water will be monitored to evaluate water quantity and quality through the reclaimed areas. Monitoring sites and frequency will be determined by WDEQ guidelines.

3.6.4. Residual Impacts

No AVFs have been identified in the general analysis area, and the majority of Hay Creek has already been diverted according to appropriate regulations to accommodate existing mining operations. Groundwater is expected to recharge and be reestablished in a similar manner to premining conditions, but may not exhibit the same hydrologic or chemical characteristics. The stream channel and the reclaimed valley floor would be reconstructed to mimic premining characteristics, but reconstruction would be an approximation. These impacts would be permanent but insignificant due to the absence of AVFs in the general analysis area.

3.7. Wetlands

This section discusses the affected environment as it relates to wetlands identified in the general analysis area through the National Wetland Inventory (NWI) mapping system (USFWS 2007). It identifies potential impacts on those wetlands that would result from the Proposed Action and alternatives. For the purposes of this analysis, wetland determinations in the general analysis area were based on the NWI maps and a 2007 reconnaissance-level field visit by trained ICF International (ICF) wetland biologists. The field visit was conducted to ground-truth the current status of previously mapped NWI wetlands, in keeping with current BLM Data Adequacy Standards (1987) for EIS analyses of wetlands.

3.7.1. Affected Environment

"Waters of the U.S." is a collective term for all areas subject to regulation by the U.S. Army Corps of Engineers (Corps) under section 404 of the Clean Water Act. Waters of the U.S. include special aquatic sites, large or small geographic areas that possess special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values (40 CFR 230.3). Wetlands are a type of special aquatic site defined as "those areas that are inundated or saturated by surface or groundwater at a frequency and

duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (33 CFR 328.3(a)(7)(b)).

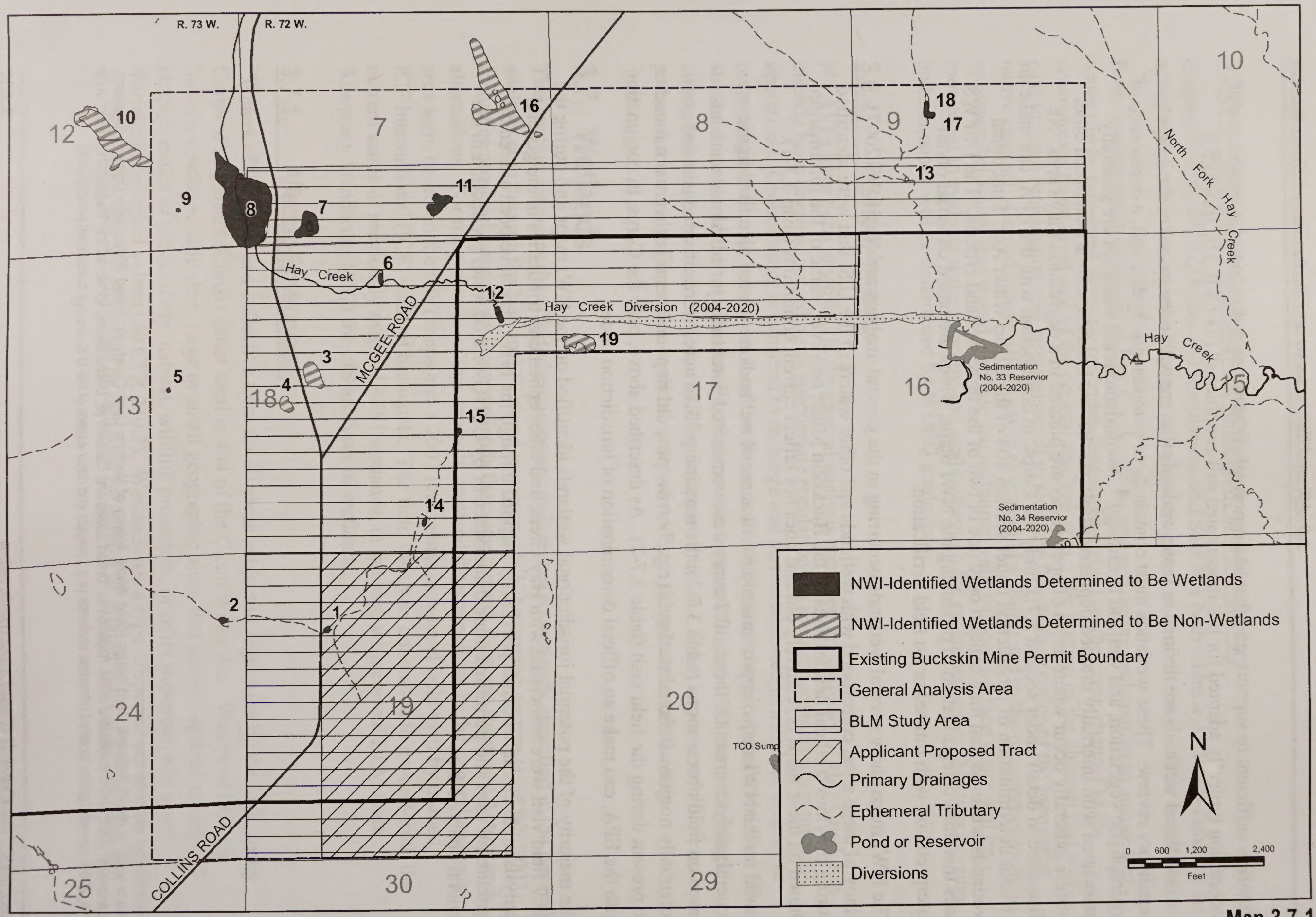
Jurisdictional wetlands are defined as those wetlands that are within the extent of the Corps' regulatory review. These wetlands must contain three components: hydric soil, a dominance of hydrophytic vegetation, and wetland hydrology.[4] Nonjurisdictional wetlands are generally associated with internally drained depressions/playas that are isolated; nonjurisdictional other waters generally occur where areas of open water are ponded in a depression/playa area. As discussed in detail under section 3.7.3, only the Corps, in conjunction with the EPA, can make an official determination of jurisdiction under section 404 of the Clean Water Act. Functional wetlands are areas that may contain only one or two of the three wetland criteria. The USFWS uses this third categorization in producing the NWI maps, which are based on aerial photo interpretation with limited or no field verification.

The NWI maps show several wetlands occurring in the general analysis area (USFWS 2007). Many of these areas correspond with wetlands and other waters of the U.S. that were identified during previous wetland delineations of the Buckskin Mine; however, some of the information shown on these maps is relatively old and does not reflect current conditions (map 3.7-1).

Based on the NWI maps, approximately 64.44 acres of wetlands have been identified in the general analysis area. Of these, 30.7 acres were considered potentially jurisdictional wetlands based on field observations (table 3.7-1); the remaining 33.74 acres were either considered as potentially nonjurisdictional wetlands (e.g., borrow pits, old impoundments) or were not found to be present during the field visit (table 3.7-2). As described above, only the Corps, in conjunction with the EPA, can make an official determination of jurisdiction under.

The majority of the potential jurisdictional wetlands identified on the NWI maps and during the 2007 field visit were associated with Hay Creek and other ephemeral tributaries in the general analysis area. Some wetlands previously mapped through the NWI may have been altered by agricultural uses and permitted mine disturbance or by CBNG-related water production in the general analysis area.

[4] As a result of recent Supreme Court rulings (*Solid Waste Agency of Northern Cook County vs. United States Army Corps of Engineers*, January 9, 2001; and consolidated cases *Rapanos vs. United States* and *Carabell vs. United States*, known as the "Rapanos" decision, June 19, 2006) non-navigable, isolated intrastate wetlands (e.g., playas) and other waters of the U.S. are not considered jurisdictional.



No warranty is made by the Bureau of Land Management for use of the data for purposes not intended by BLM.

Map 3.7-1

NWI Wetlands and Other Waters in the General Analysis Area

Table 3.7-1. NWI-Identified Wetlands in the General Analysis Area

Wetland Name	NWI Wetland Classifications[a]	Wetland Type[b]	Field Determination[c]	Acres
NWI 1	PABFh	Freshwater pond	Wetland (impounded)	0.24
NWI 2	PEMAh	Freshwater emergent wetland	Wetland (CBNG pond)	0.26
NWI 5	PEMCh	Freshwater emergent wetland	Wetland (impounded)	0.10
NWI 6	PEMAh	Freshwater emergent wetland	Wetland (CBNG pond)	0.29
NWI 7	PEMA PEMC	Freshwater emergent wetland	Wetland (temporary ponding)	3.0
NWI 8	PUBFx PEMA PEMC	Freshwater emergent wetland and freshwater pond	Wetland (dry playa)	22.82
NWI 9	PUSAx	Other	Wetland (surface ponding)	0.10
NWI 11	PEMA	Freshwater emergent wetland	Wetland (farmed wetland)	2.24
NWI 12	PEMCh PABFh)	Freshwater emergent wetland and freshwater pond	Wetland (impounded)	0.58
NWI 14	PEMCh	Freshwater emergent wetland	Wetland (CBNG pond)	0.24
NWI 15	PEMAh	Freshwater emergent wetland	Wetland (impoundment)	0.15
NWI 17	PABFh	Freshwater pond	Wetland (dry impoundment)	0.68
Total Acres				**30.7**

NWI = National Wetland Inventory; P = palustrine; EM = emergent; AB = aquatic bed; US = unconsolidated shore; A = temporarily flooded; F = semi-permanently flooded; C = seasonally flooded; x = excavated; h = diked/impounded; CBNG = coal bed natural gas

[a] Some of the wetlands studied had multiple wetland classifications associated with the wetland.

[b] Based on USFWS NWI map.

[c] Based on 2007 reconnaissance-level field visit.

Source: USFWS 2007; Cowardin et al. 1979.

Table 3.7-2. NWI-Identified Wetlands Confirmed to be Non-Wetlands in the General Analysis Area

Wetland Name	NWI Wetland Classifications[a]	Wetland Type[b]	Field Determination[c]	Acres
NWI 3	PEMA	Freshwater emergent wetland	Not a wetland (borrow pit)	2.58
NWI 4	PEMA	Freshwater emergent wetland	Not a wetland (borrow pit)	1.09
NWI 10	PABFh PEMA PEMAh	Freshwater emergent wetland and freshwater pond	Not a wetland	11.67
NWI 13	PEMC	Freshwater emergent wetland	Not a wetland (old impoundment)	0.10
NWI 16	PEMA PEMCx	Freshwater emergent wetland	Not a wetland (non irrigated hay field)	14.7
NWI 18	PEMCh	Freshwater emergent wetland	Not a wetland	0.16
NWI 19	PEMA PABFh	Freshwater emergent wetland and freshwater pond	Not a wetland (disturbed area)	3.44
Total Acres				**33.74**

NWI = National Wetland Inventory; P = palustrine; EM = emergent; AB = aquatic bed; A = temporarily flooded; F = semi-permanently flooded; C = seasonally flooded; x = excavated; h = diked/impounded

[a] Some of the wetlands studied had multiple wetland classifications associated with the wetland.

[a] Based on USFWS NWI map.

[c] Based on 2007 reconnaissance-level field visit or unrelated 2008 wetland delineation in the overlap area.

Source: USFWS 2007; Cowardin et al.1979.

Wetlands occur in a variety of forms in the general analysis area, with palustrine wetlands being the most common and abundant. Palustrine wetlands are defined by their close association with emergent herbaceous marshes, swales, or wet meadows and are supported by saturated soils along the banks of the drainages (Cowardin et al. 1979). Wetlands support a variety of vegetation types and occur mainly along drainages in the general analysis area. Hydrology for these areas is provided primarily by surface runoff from adjacent uplands and discharged CBNG waters.

Hay Creek, which flows primarily from west to east, several other tributaries that generally flow into Hay Creek, and various open water areas (e.g., stockponds, impounded reservoirs) are potential other waters of the U.S. These features carry or store water but do not meet the criteria for classification as wetlands. The Buckskin Mine's approved mining plan allows disturbance of a portion of the Hay Creek channel. Beginning in 2006, approximately 1.75 miles of the channel were diverted into the Hay Creek Diversion (map 3.5-3) to facilitate mining in the northern extent of the existing Buckskin Mine permit area. Additional details regarding water resources are provided in section 3.5.

Soils in the general analysis area consist mainly of loams, sandy loams, and some clay loams. One hydric soil unit, Felix Clay, is located in the general analysis area (NRCS 2008), on slopes ranging from 0 to 2% and in soils that are developing in alluvium derived from sandstone and shale on gently sloping uplands. The hydric soil unit is located near wetlands NWI 8 and NWI 9 (table 3.7-1). Section 3.8 contains additional information on soils in the general analysis area.

The specific functions (e.g., agriculture, livestock, and wildlife) of each identified wetland will be determined during the delineation associated with the permitting process, should a lease be issued and are, therefore, not addressed in detail as part of the EIS analysis.

3.7.2. Environmental Consequences

3.7.2.1. *Proposed Action*

Under the Proposed Action, surface mining in the proposed tract (419 acres) and mine-related activities in the support area (241 acres) would have a moderate, permanent impact on two small, potentially jurisdictional NWI-inventoried wetlands (NWI 1 and NWI 14, 0.48 acre) (table 3.7-3, map 3.7-1). Activities in the remainder of the overlap area (474 acres) that are related to mining existing coal leases would have a moderate, permanent impact on two additional potentially jurisdictional NWI-inventoried wetlands (NWI 12 and NWI 15, 0.73 acre). NWI 1 consists of a small, semi-permanently flooded, diked impoundment in the extreme northwestern corner of the proposed tract (map 3.7-1); field observations over the years have indicated that the reservoir is wet primarily during early spring months. NWI 14 is associated with a CBNG pond, and the remaining two NWI-inventoried wetlands are associated with impoundments. All wetland functions would be lost during mining and support activities. These impacts would be mitigated during reclamation by creating equivalent acreages of wetlands elsewhere in the Buckskin Mine permit area to ensure no net loss of wetland function in the general analysis area (section 3.7.3). No additional reaches of Hay Creek would be diverted under the Proposed Action.

Table 3.7-3. Potential Wetland Impacts under the Proposed Action and Alternatives[a]

Wetland Name	Alternative 1 (Acres)	Proposed Action (Acres)	Alternative 2 (Acres)[b]
NWI 1		0.24	0.24
NWI 12	0.58	0.58	0.58
NWI 14		0.24	0.24
NWI 15	0.15	0.15	0.15
NWI 17			0.68
Total Acres	0.73	**1.21**	**1.89**

[a] Wetlands partially within a disturbance area were considered a full take, because a partial take of a wetland could affect the function of the entire wetland.

[b] NWI 2, NWI 5, NWI 6, NWI 7, NWI8, NWI 9, and NWI 11 are located in the operationally limited lands where mining activity is not anticipated to occur; therefore, Alternative 2 would not affect these wetlands. The remaining NWI-inventoried wetlands were confirmed as non-wetlands during the 2007 site visit (table 3.7-2).

3.7.2.2. Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have a moderate, permanent impacts on two NWI-inventoried wetlands in the overlap area (NWI 12 and NWI 15, 0.73 acre) (table 3.7-3, map 3.7-1). As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future. These impacts would be mitigated during reclamation by creating equivalent acreages of wetlands elsewhere in the Buckskin Mine permit area to ensure no net loss of wetland function in the general analysis area (section 3.7.3).

3.7.2.3. Alternative 2

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) and mine-related activities in the support area (926 acres) would have a moderate, permanent impact on three small, potentially jurisdictional NWI-inventoried wetlands (NWI 1, NWI 14, and NWI 17, 1.16 acres) (table 3.7-3, map 3.7-1). Activities in the remainder of the overlap area (38 acres) that are related to mining existing coal leases would have a moderate, permanent impact on two additional potentially jurisdictional NWI-inventoried wetlands (NWI 12 and NWI 15, 0.73 acre).

Approximately 28.8 acres (94%) of the NWI-inventoried wetlands are west of one or both county roads and in the area considered operationally limited by Kiewit; Kiewit does not anticipate relocating either road to access federal coal reserves. All wetland functions would be lost during mining activities, but the general analysis area would experience no net loss of wetlands due to permit requirements to create equivalent acreages of wetlands elsewhere in the Buckskin Mine permit area (section 3.7.3). Kiewit does not expect to divert any additional segments of Hay Creek under Alternative 2 due to the location of the drainage in the operationally limited area west of the county roads.

3.7.3. Regulatory Compliance, Mitigation, and Monitoring

Since the 2007 NWI-based wetland determination was completed, a portion of the general analysis area was formally delineated by ICF wetland biologists. The results of this study are currently being reviewed by the Corps and the issuance of an approved jurisdictional determination is pending. Because the jurisdictional status of the delineated wetlands and other non-wetland waters has yet to be determined, the results of the post-2007 delineation are not presented in this document.

If an action alternative is implemented, a wetland delineation will be completed for all areas outside of the area recently delineated. That report will be submitted to the Corps for verification and an approved jurisdictional determination will be requested. If unavoidable impacts on jurisdictional wetlands and other waters of the U.S. are proposed under either action alternative, a section 404 Permit Application will be prepared. Kiewit will mitigate for all affected jurisdictional wetlands in accordance with section 404 of the Clean Water Act.

Mitigation is required at a minimum one-to-one ratio for jurisdictional wetlands. The wetland replacement plan, which must be approved by the Corps, requires no net loss of wetland area and function.

Section 404 of the Clean Water Act does not cover nonjurisdictional wetlands; however, Executive Order 11990 requires that all federal agencies protect all wetlands. Mitigation for impacts on nonjurisdictional wetlands will be specified during the permitting process as required by the authorized state or federal agency (which may include the WDEQ and the OSM). Because surface land in the general analysis area is privately owned, the private surface owner may also contribute to decisions regarding mitigation for impacts on nonjurisdictional wetlands. The WDEQ allows and sometimes requires mitigation of nonjurisdictional wetlands, depending on the quality of the wetland functions. That agency may also require replacement of wetlands or playas with hydrologic significance.

Wetland mitigation may begin prior to mining activities, depending on hydrologic resources available. Interim mitigation may be provided through the many sediment-control structures (ponds) created during mining, drainage diversion, removal of livestock from riparian areas, and repair of damaged wetlands.

3.7.4. Residual Impacts

Replaced wetlands (jurisdictional or functional) may not duplicate the exact function and landscape features of the premining wetlands, but all wetland replacement plans will be approved by the Corps, which has special required permitting procedures to assure that no net loss of wetlands will occur after reclamation.

3.8. Soils

This section describes the affected environment as it relates to soils in the general analysis area, and identifies potential impacts on soils that would result from the Proposed Action and alternatives.

3.8.1. Affected Environment

The affected environment described in this section is based on National Resources Conservation District soil surveys of Campbell County, Wyoming, which includes the proposed tract and general analysis area (National Resources Conservation Service 2004).

Soils vary in composition and depth depending on where and how they were formed. Major factors involved in the formation of soils include whether the material was transported, the source of the material, and how the material was weathered after transportation. Five soil formation processes causing different soil types were noted in the general analysis area: 1) soils developing predominantly in alluvium (stream-laid) or eolian (wind-blown) deposits derived from sandstone and shale on upland ridges; 2) soils developing predominantly in alluvium

derived from sandstone and shale on gently sloping uplands; 3) soils developing predominantly in alluvium or colluviums (material that has been transported downslope by rock falls, slides, and slumps) derived from porcelanite on gently sloping uplands; 4) soils developing predominantly in residuum (residual material)weathered from sandstone and shale on gently sloping uplands; and 5) soils developing predominantly in alluvium over residuum weathered from sandstone and shale on gently sloping uplands.

Soil surveys were conducted in 2007 by BKS Environmental Associates, Inc., to an Order 1-2 resolution. The inventories included field sampling and observations at the appropriate number of individual sites to provide adequate sample sizes, and analysis of representative collected samples. Soils in the general analysis area were identified by series, which consist of soils that have similar horizons (distinct horizontal layers) in their profile (sequence of soil layers). Soil types and depths in the general analysis area are similar to soils currently being salvaged and used for reclamation at the Buckskin Mine and other nearby mines in northern Campbell County. Additional detailed information about the soil types sampled during 2007 is included in the Soils Data Report, which can be viewed at the High Plains District office of the BLM in Casper, Wyoming. These site-specific soil surveys located hydric (saturated) soils and inclusions of hydric soils, which are components used in identifying wetlands. Wetlands are discussed in section 3.7 of this EIS. Areas with soils that are not suitable to support plant growth include sites with high salinity (salty content), high sodicity (amount of sodium present), or excessive clay or sand content.

3.8.2. Environmental Consequences

3.8.2.1. *Proposed Action*

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mine-related activities in the support area (241 acres) would have a moderate, long-term impact on bulk density and infiltration rates in soils. Activities in these areas would have a moderate, beneficial, long-term impact on soil uniformity and decreased runoff, as well as chemical properties. The Proposed Action would have a moderate, short- to long-term impact on biological properties in soils that are stockpiled before reclamation. Activities in the remainder of the overlap area (474 acres) related to mining existing coal leases would have the same impacts as those in the proposed tract and support area.

Soils would be incrementally removed as mining and activities related to mining progress through the area. Soils removed and stockpiled during mining would be replaced under reclamation. The replaced soils would have a more uniform soil chemistry and soil nutrient distribution. Average topsoil quality would be improved because soil material that is not suitable to support plant growth would not be salvaged for use in reclamation. This would result in more uniform vegetative productivity on reclaimed lands.

The baseline soils analysis of the proposed tract and support area indicates that the amount of suitable soil available for redistribution on disturbed areas would have an average depth of

17 inches (1.4 feet). The replaced soil would support a stable and productive vegetation community adequate in quality and quantity to support the planned postmining land uses (i.e., wildlife habitat and livestock grazing).

Reclamation would result in a temporary increase in the near-surface bulk density of soils in the proposed tract. The average soil infiltration rates would generally decrease, which would increase the potential for runoff and soil erosion. However, topographic moderation following reclamation would potentially reduce runoff, which would tend to offset the effects of decreased soil infiltration capacity. The change in soil infiltration rates would not be permanent because revegetation and natural weathering would eventually form a new soil structure in the reclaimed soils. Infiltration rates would gradually return to premining levels.

The reclaimed landscape would contain stable landforms and drainage systems that would support the postmining land uses. Reconstructed stream channels and floodplains would be designed and established to closely mimic priming conditions and ensure proper drainage of water across the reclaimed spoils. Sediment-control measures would be implemented where runoff occurs to preserve reclaimed materials. Indirect impacts on biological organisms in the soil on the proposed tract and support area would include short- to long-term reduction in soil organic matter, microbial populations, seeds, bulbs, rhizomes, and live plant parts in soil resources that are stockpiled before replacement.

3.8.2.2. *Alternative 1 (No Action)*

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have similar impacts to those described under the Proposed Action. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

3.8.2.3. *Alternative 2*

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) and mine-related activities in the support area (926 acres) would have a moderate, short- to long-term impact on most soils characteristics following reclamation. These activities would have moderate, beneficial, long-term impacts on soil uniformity and reduced runoff postmining. Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases would have similar impacts and beneficial effects as those in the BLM study area and support area. Baseline soils characteristics and reclamation practices would be the same as those described under the Proposed Action.

3.8.3. Regulatory Compliance, Mitigation, and Monitoring

If either of the action alternatives is implemented, Kiewit will mitigate for the impacts on soil resources in accordance with WDEQ reclamation standards and requirements.

Soils suitable to support plant growth will be salvaged for use in reclamation. Soil stockpiles will be protected from disturbance and erosional influences. Soil material that is not suitable to support plant growth will not be salvaged; soil or overburden materials containing potentially harmful chemical elements (e.g., selenium) will not be used in reclamation. A minimum of 4 feet of suitable overburden will be placed on the graded backfill surface below the replaced soil to meet state guidelines for vegetation root zones; those depths will be confirmed by sampling before topsoil is applied. Redistributed topsoil will be sampled to document redistribution depths and seeded to reduce wind erosion. Sediment-control structures will be constructed, as needed, to trap eroded soil. Vegetation growth will be monitored in reclaimed areas to confirm vegetation establishment and acceptability for bond release and determine if soil amendments are needed. Appropriate normal husbandry practices may be implemented to achieve specific reclamation goals.

3.8.3. Residual Impacts

The action alternatives would result in long-term alteration of soil characteristics. Existing soils would be mixed and redistributed, and soil-forming processes would be disturbed by mining.

3.9. Vegetation

This section addresses existing vegetation in the general analysis area and impacts on vegetation resulting from the Proposed Action and alternatives. Wetlands are addressed in section 3.7. Threatened, endangered, proposed, and candidate plant species, and BLM Sensitive Species are addressed in appendices J and K, respectively.

3.9.1. Affected Environment

The affected environment for the general analysis area is based on the following:

- Vegetation communities in the overlap area (656 acres) were mapped and quantitatively sampled during baseline inventories for a permit amendment in 2000. All field sampling and mapping efforts were conducted in accordance with WDEQ mine permitting requirements.
- Vegetation communities in the remainder of the general analysis area (2,191 acres) were mapped and quantitatively sampled in 2007 and 2008; those efforts also complied with WDEQ permitting requirements. Additional detailed information about these survey methods and results is included in the Vegetation Data Report, which can be viewed at the High Plains District office of the BLM in Casper, Wyoming. That report includes a map showing the primary vegetation communities in the general analysis area.

Vegetation in the general analysis area consists of species common to eastern Wyoming and is consistent with vegetation that occurs in the existing Buckskin Mine permit area. Eight distinct vegetation communities were identified and mapped in the general analysis area. Four additional categories were also mapped: Disturbed Areas, Tree Shelterbelts, Rough Breaks, and Open Water. Each of the latter three groups accounts for less than 1% of the total area. All vegetation

communities and additional classifieations are deseribed below. Table 3.9-1 provides acreages and percent eomposition for eaeh eategory.

Table 3.9-1. Vegetation Communities in the General Analysis Area

	General Analysis Area		BLM Study Area		Proposed Tract	
Vegetation Community	**Acres**	**Composition (%)**	**Acres**	**Composition (%)**	**Acres**	**Composition (%)**
Agricultural Cropland	727.1	25.5	532.9	28.3	39.3	9.4
Agricultural Pasture: Moderate Management	86.2	3.0	54.4	2.9	3.7	0.9
Agricultural Pasture: Intensive Management	56.1	2.0	56.1	3.0	12.0	2.8
Bunchgrass Prairie	232.8	8.2	160.8	8.5	0.0	0.0
Lowland Prairie	124.9	4.4	77.1	4.1	2.2	0.5
Mixed Grass Prairie	462.6	16.2	207.1	11.0	41.7	10.0
Sandy Prairie	455.9	16.0	331.5	17.6	252.6	60.3
Riparian Bottomland	174.3	6.1	77.4	4.1	4.1	1.0
Big Sagebrush Shrubland	302.0	10.6	202.8	10.8	45.8	10.9
Trees: Shelter Belt	0.8	0.03	0.8	0.04	0.9	0.2
Disturbed: Roads	46.4	1.6	37.5	2.0	9.5	2.3
Disturbed: CBNG	41.0	1.4	19.1	1.0	7.0	1.7
Disturbed: Residential	20.4	0.7	20.4	1.1	0.0	0.0
Disturbed: Other Non-Mining	11.9	0.4	9.0	0.5	0.0	0.0
Disturbed: Mining	88.7	3.1	88.7	4.7	0.0	0.0
Rough Breaks	12.5	0.4	5.0	0.3	0.0	0.0
Open Water	3.4	0.1	2.0	0.1	0.0	0.0
Total[a]	**2,847.0**	**100.0**	**1,883.0**	**100.0**	**419.0**	**100.0**

CBNG = coal bed natural gas

[a] Totals are rounded.

Source: LandTrak Resources, Inc. 2009.

3.9.1.1. *Agricultural Cropland*

Agricultural eropland in the general analysis area eonsists of dryland, small grain produetion, and alfalfa hay production. The small grain produetion appears to use a fallow rotation eropping system. The alfalfa hay production is mostly dryland. Approximately 25.5 % (727.1 aeres) of the general analysis area is Agrieultural Cropland.

3.9.1.2. *Agricultural Pasture*

The elassification system used for Agricultural Pasture—low management, moderate management, and intensive management—evaluates management efforts based largely on the presence of sagebrush.

Low Management

Low management Agriculture Pasture, which contains stands of old-growth sagebrush, is not present in the general analysis area.

Moderate Management

Moderate management Agriculture Pasture accounts for approximately 3.0% (86.2 acres) of the general analysis area. This vegetation community is largely a mixture of cool-season, introduced pasture grasses such as crested wheatgrass (*Agropyron cristatum*) and smooth brome (*Bromus inermis*). A minor component of cool-season native species is present, as well.

Some management of shrub species has occurred in this vegetation community. Typically, this vegetation community is hayed when sufficient moisture has occurred to make harvesting economically viable. In dry years, this community is used as early-season pasture for livestock production. If it is not hayed for several years, the sagebrush will become reestablished in this vegetation community.

Intensive Management

Intensive management Agricultural Pasture accounts for approximately 2.0% (56.1 acres) of the general analysis area. This vegetation community is located mostly along the edges of Agricultural Cropland. It is typically mowed annually to allow access to the cropland. This vegetation community is comprised almost exclusively of cool-season, introduced pasture grasses such as crested wheatgrass and smooth brome. Frequent mowing prevents shrubs from becoming reestablished.

3.9.1.3. *Bunchgrass Prairie Grassland*

Bunchgrass Prairie Grassland accounts for approximately 8.2% (232.8 acres) of the general analysis area. This community typically occurs on clinker sandstone or shale hills, knolls, and slopes that are moderately steep to steep. Soils are predominantly in the Ironbutte, Fairburn, Mittenbutte, Samday, Shingle, and Rock Outcrop map units that have shallow soils and usually a high coarse-fragment content.

Vegetation species associated with Bunchgrass Prairie Grassland include: little bluestem (*Schizachyrium scoparius*), bluebunch wheatgrass (*Pseudoroegneria spicata*), Indian ricegrass (*Achnatherum hymenoides*), needle-and-thread (*Hesperostipa comata*), and some blue grama (*Bouteloua gracilis*). Some big sagebrush (*Artemisia tridentata*) occurs in this community, typically in small, mosaic patterns as described in the Big Sagebrush Shrubland category, below.

3.9.1.4. *Lowland Prairie Grassland*

Lowland Prairie Grassland accounts for approximately 4.4% (124.9 acres) of the general analysis area. This community occurs primarily on gently sloping, often saline plains: on gently sloping benches usually adjoining Riparian Bottomlands: and in closed basins. Within this community, the amount of soil saturation, concentration of soil salts, and presence or absence of subirrigation varies with topographic position. Salt concentrations in lowland prairie soils influence

plant-available water, thus affecting vegetation composition. Soil salt accumulations play a part in limiting moisture in the subirrigated category of the lowland prairie vegetation community.

Transitional zones between soil water conditions in this community may be abrupt, or gradual and subtle, depending on local topographic and stormwater runoff conditions. Some portions of the lowland prairie benefit from periodic subirrigation which usually results in more robust growth of community vegetation. When present, subirrigation water tends to occur 16 inches below the ground surface. Soils are predominantly Boruff, Haverdad, and Felix series.

Vegetation species associated with Lowland Prairie Grassland include: western wheatgrass (*Pascopyrum smithii*), saltgrass (*Distichlis spicata*), prairie cordgrass (*Spartina pectinata*), streambank/thickspike wheatgrass (*Elymus lanceolatus*), and big sagebrush.

3.9.1.5. *Mixed-Grass Prairie Grassland*

Mixed-grass Prairie Grassland accounts for approximately 16.2% (462.6 acres) of the general analysis area. This community occupies rolling hills and ridges with moderate to deep soil development. Soils are predominantly loams, sandy clay loams, fine sandy loams, and sandy loams. Occasionally, clay loams and loamy sands are found in this community. This community is most strongly correlated with deeper soils, including Bidman, Cambria, Kishona, Lawver, Teckla, and Wibaux loams, and Hiland sandy clay loam.

Vegetation species associated with Mixed-grass Prairie Grassland include: western wheatgrass, Indian ricegrass, needle-and-thread, blue grama, and big sagebrush. When big sagebrush occurs in this community, it is typically in small, mosaic patterns and accounts for less than 20% of the total vegetation cover composition.

3.9.1.6. *Sandy Prairie Grassland*

Sandy Prairie Grassland accounts for approximately 16.0% (455.9 acres) of the general analysis area. This community occurs on rolling hills and plains, with occasional wind blow-outs. It is most commonly associated with fine sandy loams and sandy loams (e.g., Taluce, Terro, Vonalee, and Vonalf soils), but also occurs on loams, sandy clay loams, loamy sands, and fine sands. The soil series is generally is found on deeper soils; however, moderately deep soils are not uncommon.

Vegetation species associated with Sandy Prairie Grassland include: Indian ricegrass, needle-and-thread, blue grama, prairie sand reed (*Calamovilfa longifolia*), and threadleaf sedge (*Carex filifolia*).

3.9.1.7. *Riparian Bottomland*

Riparian Bottomland accounts for approximately 6.1% (174.3 acres) of the general analysis area. This community is associated primarily with Hay Creek and is limited in distribution due to the drainage's narrow width throughout most of its length. In a few atypical instances, isolated

Riparian Bottomland communities grow on hillsides in saturated soils associated with groundwater seeps.

Species composition in riparian bottomland varies, and is primarily correlated with site-specific hydrologic conditions. This community can be subdivided into two main sub-communities: Riparian Bottomland Meadow and Riparian Bottomland Marsh. Riparian Bottomland Meadow is the predominate sub-community found throughout Hay Creek. The most prevalent vegetation type is cordgrass, with minor inclusions of spikerush and bullrush. Riparian Bottomland Marsh and emergent vegetation zones exist around the perimeters of stockponds. The dominant vegetation types in this sub-community are bullrushes, spikerushes, and sedges. Rushes typically have a higher relative cover value than cordgrass in these areas. Production values for Riparian Bottomland sites can vary independently of cover values.

These bottomland communities typically occur on soils that are characteristically deep and poorly drained, including Boruff series and mollic fluvaquents.

3.9.1.8. *Big Sagebrush Shrubland*

Big Sagebrush Shrubland accounts for approximately 10.6% (302 acres) of the general analysis area (table 3.9-1). For purposes of this study, this community is defined as areas in which shrub and sub-shrub species comprise more than 20% of the total vegetation cover. Big Sagebrush Shrubland is found on a variety of topography, including gentle slopes, rolling hills and steep, dissected breaks. This community occurs commonly on shallow clay loams (such as the Theedle and Shingle series) and deep loams (such as the Forkwood and Cushman series), and occasionally on sandy loams. This shrub community occurs in a mosaic pattern across the landscape. Individual shrub patches range from 0.3 acre to 27.0 acres, with 4.9 acres as the average area. The patches are loosely connected by narrow corridors of other vegetation communities (usually Mixed Grass Prairie or Lowland Prairie Grassland) with only a few shrubs present.

3.9.1.9. *Disturbed Areas*

In addition to surface mining, several other forms of disturbance are present in the general analysis area. Those combined features comprise approximately 7.2% (208.4 acres) of the area and include county roads, historic two-track roads, CBNG roads and infrastructure, residential sites, and other disturbance not related to mining.

3.9.1.10. *Tree Shelterbelt*

Most of the trees in the general analysis area are associated with residential disturbance. Due to their extremely limited presence, residential trees were included in the Tree Shelterbelt category. One stand of plains cottonwood (*Populus deltoids*) is present in the southeastern quarter of section 19, T52N R72W, within the overlap area. This cottonwood stand encompasses approximately 0.03% (0.8 acre) of the general analysis area.

3.9.1.11. Rough Breaks

Rough Breaks refers to areas within the general analysis area where rock outcrops (including clinker) and badlands clay soils are associated with steep topography and limited vegetation. This category comprises 0.4% (12.5 acres) of the general analysis area.

3.9.1.12. Open Water

Open Water refers to water standing in reservoirs and stockponds in the general analysis area. Water bodies comprise 0.1% (3.4 acres) of the general analysis area.

3.9.2. Environmental Consequences

Impacts on wetlands and wildlife/livestock relative to vegetative disturbance are discussed in section 3.7 and section 3.10, respectively.

3.9.2.1. Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mine-related activities in the support area (241 acres) would have a moderate, short-term impact on vegetation, erosion, and grazing opportunities during mining. This alternative would have a negligible, long-term effect on changes in vegetation patterns and diversity after revegetation in the proposed tract and support area. It would have a minor, long-term impact on approximately 46 non-contiguous acres of sagebrush in these areas, as well as on wildlife use of the area; no rough breaks would be affected. The Proposed Action would have a moderate, short-term impact on the potential for invasion by nonnative plant species. Activities in the remainder of the overlap area (474 acres) related to mining existing coal leases would have the same impacts as most of those in the proposed tract and support area. Exceptions would be that activities in the overlap area would impact approximately 80 non-contiguous acres of sagebrush and one stand of plains cottonwood encompassing approximately 0.8 acre in section 19, T52N R72W.

Native vegetation would be incrementally removed and reclaimed during and after mining, respectively. Sandy Prairie Grassland community is the most prevalent in the disturbance areas (table 3.9-1), followed to a lesser degree by agricultural lands and shrublands. Disturbance in the agricultural lands would likely disrupt one landowner's ranching and farming operation. An additional five vegetative communities would also be affected, but to a considerably lesser degree.

Impacts associated with the removal of vegetation could include increased soil erosion and differences between premining and postmining vegetative communities. The transition from native to reclaimed grasslands would be the least dramatic, with species composition expected to be similar to premining communities. As indicated, vegetation loss and subsequent reclamation would likely occur incrementally across disturbed areas, depending on the direction and rate of mining. Shrubs and trees affected by mining activities would be reestablished according to the current WDEQ-approved reclamation plan for the Buckskin Mine.

3.9.2.2. Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have similar impacts to those described under the Proposed Action for most factors during mining and following reclamation. It would have a minor, long-term effect on approximately 86 non-contiguous acres of sagebrush, as well as on wildlife use of the area. This alternative would impact one stand of plains cottonwood, encompassing approximately 0.8 acre in section 19, T52N R72W. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Vegetation removal and reclamation would occur incrementally in the overlap area. Shrubs and trees affected by mining activities would be reestablished according to the current WDEQ-approved reclamation plan for the Buckskin Mine.

3.9.2.3. Alternative 2

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) and mine-related activities in the support area (926 acres) would have the same impacts on vegetative characteristics during mining and following reclamation as those described under the Proposed Action. This alternative would have a minor, long-term impact on approximately 302 non-contiguous acres of sagebrush and 12 non-contiguous acres of rough breaks; two stands of trees (primarily cottonwoods) would be affected in the BLM study area and support area, as would wildlife use of the area. Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases would have the same impacts as those in the BLM study area and support area, though no additional sagebrush or rough breaks would be affected in that area. One stand of plains cottonwood, encompassing approximately 0.8 acre in section 19, T52N R72W, would be removed from the overlap area prior to mining.

Vegetation removal and reclamation would occur incrementally throughout the general analysis area. Agricultural Cropland is the most prevalent habitat in this area, followed by Mixed Grass Prairie, Sandy Prairie, and Big Sagebrush (table 3.9-1). The remaining vegetation communities and habitat classifications could also experience some level of disturbance (table 3.9-1). Shrubs and trees affected by mining activities would be reestablished according to the current WDEQ-approved reclamation plan for the Buckskin Mine.

Impacts associated with the removal of vegetation could include increased soil erosion and differences between premining and postmining vegetative communities. The latter impacts would be reduced due to the similarity between premining and postmining vegetation in most of the affected area. Vegetation loss and subsequent reclamation would likely occur incrementally across the final tract configuration, depending on the direction and rate of mining. Impacts on vegetation from topsoil stripping and other mine-related activities would be addressed in accordance with the WDEQ approved mining and reclamation plan.

Mining activities under this alternative could impact trees within residential disturbance areas if Kiewit acquires the surface rights for those homes; however the company does not intend to pursue that option. Disturbance in agricultural lands would likely disrupt one landowner's ranching and farming operation.

3.9.3. Threatened, Endangered, Proposed, and Candidate Plant Species, and BLM Sensitive Species

The current list of federal endangered, threatened, and candidate species for Campbell County, Wyoming, includes two plant species. As of March 2010, the blowout penstemon (*Penstemon haydenii*) is considered endangered and the Ute ladies'-tresses (*Spiranthes diluvialis*) is classified as threatened (http://www.fws.gov/wyominges/PDFs/CountySpeciesLists/Campbell-sp.pdf).

Appendix J of this document contains the biological assessment for federally listed species, and appendix K contains a discussion of the BLM sensitive species evaluation. No federally listed plant species would be affected under any alternative analyzed in this EIS.

3.9.4. Regulatory Compliance, Mitigation, and Monitoring

If either action alternative is implemented, reclamation, including revegetation, will immediately follow as mining progresses through the area. Estimates of the time elapsed from topsoil stripping through reseeding of any given area range from two to five years. This would be longer for areas occupied by stockpiles, haul roads, some sediment-control structures, and other mine facilities. Some roads and facilities would not be reclaimed until all coal removal has ended and active operations have ended. No new life-of-mine facilities would be built in the proposed tract or the final tract configuration, because in either case the tract would be mined as an extension of the existing mine. By the time mining ceases, more than 75% of disturbed lands will be reseeded. The remaining 25% will be reseeded during the subsequent two to three years as the life-of-mine facilities area is reclaimed.

Reclamation will approximate premining vegetation, and reestablished vegetation will primarily consist of native species except were agricultural lands occur. Areas reclaimed for native species will be revegetated as specified in the approved mine plan using reclamation seed mixtures approved by the WDEQ. Those efforts will likely focus on a mixture of upland prairie grasslands with graminoid/forb-dominated areas to simulate the dominance of upland grasslands in the premining landscape.

Initially, reclaimed lands will be dominated by grassland vegetation, which may be less diverse than the native premining vegetation, but more diverse than agricultural areas. At least 20% of the native vegetation area will be reclaimed to native shrubs at a density of one per square meter or as required by current regulations. Shrubs will be selectively planted in riparian areas and trees will be replaced at a one-to-one ratio. Estimates for the time it will take to restore shrubs, including sagebrush, to premining density levels range from one or two decades to up to 100 years. Native vegetation from surrounding areas would enhance reclamation activities

through natural seed dispersal. The reclamation plan for the final tract configuration will include steps to control invasive, nonnative plant species.

Revegetation growth and diversity will be monitored and managed, including treating invasions of nonnative species, until the final reclamation bond is released (a minimum of 10 years). Erosion will be monitored to determine if corrective action is needed during establishment of vegetation. Controlled grazing will be used during revegetation as a management tool and to determine the suitability of the reclaimed land for postmining land uses. Following completion of reclamation (seeding with the final seed mixture) and before release of the reclamation bond, a permanent, diverse, and productive vegetative cover would be established throughout the disturbance area. The decrease in plant diversity would not seriously affect the potential productivity of the reclaimed areas, and the proposed postmining land use (wildlife habitat and rangeland) should be achieved even with the changes in vegetation composition and diversity.

Reclamation of agricultural pastures and croplands may occur, but is highly dependent on the postmine topography and landowner agreements. It is most likely that agricultural lands will be reclaimed to pastures suitable for either haying or livestock rather than croplands. Such areas will be reclaimed using a seed-mix of native grass and legume species. Agricultural croplands will be reseeded to either annual cereal grain, such as winter wheat, or to hayland with a legume such as alfalfa. Again, reclamation of cropland is dependent on postmine topography and soil suitability for crop production. Following reclamation bond release, management of the privately owned surface areas would revert to the private surface owners, who would have the right to manipulate the reclaimed vegetation.

Revegetation success and patterns in reclaimed areas would be at least partially affected by the influence of postmining topography on surface water drainage patterns. For example, the maximum postmining overland slope would be 20%, in accordance with WDEQ policy. However, the average reclaimed overland slope would not be known until the technical review of the permit revision application has been completed by the WDEQ. Although no substantial changes in the average overland slope are predicted once reclamation is complete, the location and orientation of individual slopes could influence the direction and amount of runoff from rain and snow events, which could then result in different rates of vegetative reestablishment throughout reclamation.

The climatic record of the western United States suggests that droughts could occur periodically during the life of the mine. Such droughts could severely hamper revegetation efforts, because lack of sufficient moisture would reduce germination and could damage newly established plants. Severe thunderstorms could also adversely affect newly seeded areas. Same-aged vegetation would be more susceptible to disease resulting from increased vulnerability during periods of water stress (too little or too much) than plants of various ages. Once a stable vegetative cover is established, the impact of these events would be similar to impacts on native vegetation.

Restoration of wetlands is discussed in section 3.7; monitoring of livestock grazing standards is discussed in section 3.10.

3.9.5. Residual Impacts

Reclaimed vegetative communities may never completely restore the preming native plant community. Immediately following reclamation, revegetated areas would be characterized primarily by a mixture of upland prairie grasslands with graminoid/forb-dominated areas, which does resemble the current dominant community. An overall reduction in species diversity, especially for the shrub component, could occur. The decrease in plant diversity would not seriously affect the potential productivity of the reclaimed areas, and the proposed postmining land use (wildlife habitat and livestock grazing) should be achieved even with the changes in vegetation composition and diversity. No net loss of jurisdictional wetlands would occur due to restoration requirements of the Corps (section 3.7). Any wetlands serving as stockponds or other agricultural uses would be restored in accordance with the requirements of the surface landowner.

3.10. Wildlife

This section describes the affected environment as it relates to wildlife in the general analysis area and various surrounding buffers, depending on the species, as well as impacts on wildlife and wildlife habitats that would result from the Proposed Action and alternatives.

3.10.1. General Setting

Sections 3.1, 3.2, and 3.9 provide detailed descriptions of the general setting, topography, and vegetative composition, respectively, of the general analysis area. The most pertinent information for wildlife is summarized here for reference.

The terrain in the general analysis area consists primarily of gently sloping uplands and relatively level agricultural fields, with more rugged topography in the northeastern portion of the area. Elevations in the general analysis area range from approximately 4,080 to 4,380 feet above mean sea level.

Predominant wildlife habitat types classified in the general analysis area broadly correspond with the major plant communities defined during the vegetation baseline study. The proposed tract itself is dominated (approximately 71%) by various upland grassland habitats (table 3.9-1). Habitats in the general analysis area are comprised primarily (71%) of upland grasslands and agricultural lands (approximately 40% and 31%, respectively).

For this EIS, Big Sagebrush Shrublands are defined as vegetation communities where shrub and sub-shrub species comprise more than 20% of the total vegetation cover. This habitat type makes up less than 11% of both the proposed tract (approximately 46 noncontiguous shrub acres) and surrounding general analysis area (approximately 302 noncontiguous shrub acres). The shrub community is dominated by big sagebrush and occurs in a broken mosaic pattern across the landscape. Individual shrub patches range from 0.3 acre to 27.0 acres in size, with an average of 4.9 acres. The patches are loosely connected by narrow corridors of other vegetative communities (usually Mixed-grass Prairie or Lowland Prairie), with few shrubs present. Other

habitats present to a limited extent in the general analysis area include Riparian Bottomlands, Rough Breaks, Open Water, and Tree Shelterbelts, as well as previously disturbed areas (roads, pipelines, oil and gas storage tank complexes, and well pads).

No major drainages pass through the proposed tract itself, though a closed, unnamed drainage system crosses its northwestern corner (map 3.5-3). Hay Creek flows from west to east through the northern half of the general analysis area, with a considerable portion of the channel passing through the existing Buckskin Mine permit area. Several primary and secondary tributaries are also in that area. Under natural conditions, Hay Creek and all tributaries in the area are considered ephemeral (i.e., respond only to rainfall or snowmelt events). The determination of stream classification was made using the flume monitoring data collected by the Buckskin Mine and reported in the existing permit document. Additional information regarding groundwater and surface water in the general analysis area is presented in section 3.5.

CBNG discharge water has increased the frequency and duration of streamflow events in some portions of the general analysis area. The USFWS NWI maps (2007) show one small wetland (a 0.24-acre, semi-permanently flooded, diked impoundment) in the extreme northwestern corner of the proposed tract (map 3.7-1); however, field observations over the years have indicated that it is wet primarily during early spring months. One playa and one small instream impoundment are present in the northwestern portion of the surrounding general analysis area. Those features are also seasonal, with water typically present in spring but dry by mid- to late summer. The playa is the only water body in the general analysis area that provides habitat for waterfowl, shorebirds, and other aquatic species. Due to its limited availability, it serves primarily as a staging area during spring migrations. Additional information regarding these water features is provided in section 3.5 and section 3.7. Due to the lack of permanent water sources, the general analysis area does not support any fisheries; fish species are, therefore, not discussed in this EIS.

As described in section 1.1.3, a variety of ongoing mining and reclamation support activities occur in the overlap between the general analysis area and existing permit area. Mine operations and facilities throughout the rest of the existing permit area include storage silos, coal crushing and preparation plants, and a railroad spur and loading facility, among others. These activities often involve a variety of heavy equipment and occur 24 hours per day, every day of the year. Blasting occurs during daylight hours on a nearly daily basis. Disturbance and reclamation activities occur incrementally and sequentially throughout the permit area. Because the mine also operates at night, artificial lighting is present in active pit areas and on haul roads to ensure the safety of mine employees.

3.10.2. Survey Requirements and History

Long-term information on species occurrence and habitat use in the general analysis area was based primarily on results from annual wildlife monitoring surveys conducted for the existing Buckskin Mine over the past 26 years (1984–2009). The extent of these annual surveys was based on guidance from Appendix B of the WDEQ Coal Rules and Regulations, and included multiple seasons, depending on the species and requirements in place at the time. Appendix B of

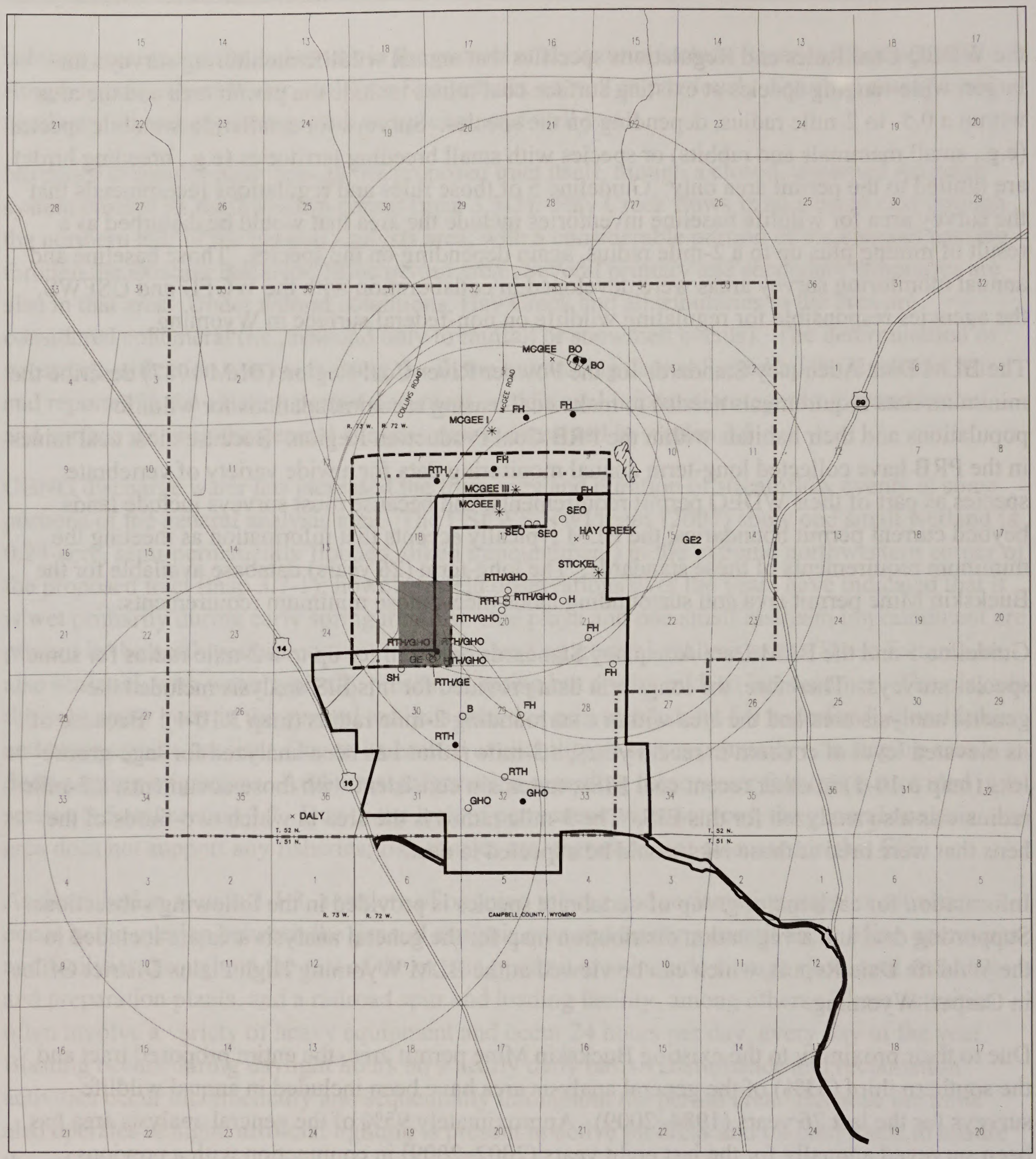
the WDEQ Coal Rules and Regulations specifies that annual wildlife monitoring surveys for larger, wide-ranging species at existing surface coal mines include the permit area and the area within a 0.5- to 2-mile radius, depending on the species. Surveys for smaller, less mobile species (e.g., small mammals and rabbits) or species with small breeding territories (e.g., breeding birds) are limited to the permit area only. Guideline 5 of those rules and regulations recommends that the survey area for wildlife baseline inventories include the area that would be disturbed as a result of mining plus up to a 2-mile radius, again depending on the species. Those baseline and annual monitoring survey areas were developed in collaboration with the WGFD and USFWS, the agencies responsible for regulating wildlife on non-federal surface in Wyoming.

The BLM Data Adequacy Standards for the Powder River Coal Region (BLM 1987) describe the minimum data requirements needed to make coal leasing recommendations for wildlife populations and their habitats within the PRB Coal Production Region. Because most coal mines in the PRB have collected long-term annual monitoring data for a wide variety of vertebrate species as part of their WDEQ permit requirements, and because most surveys include lands beyond current permit boundaries, the BLM typically accepts that information as meeting the minimum requirements of these standards. The long-term (26 years) database available for the Buckskin Mine permit area and surrounding lands meets those minimum requirements.

Guideline 5 and the BLM Data Adequacy Standards both call for up to a 2-mile radius for some species surveys. Therefore, the long-term data provided for this EIS analysis included the general analysis area and the area within a surrounding 2-mile radius (map 3.10-1). Because of its elevated level of concern in recent years, a 3-mile radius has been analyzed for sage-grouse leks (map 3.10-1) in other recent coal EISs; to remain consistent with those documents, a 3-mile radius was also analyzed for this EIS. The 3-mile radius is the area in which two-thirds of the hens that were bred at those leks would be expected to nest.

Information for each major group of vertebrate species is provided in the following subsections. Supporting data and a vegetation distribution map for the general analysis area are included in the Wildlife Data Report, which can be viewed at the BLM Wyoming High Plains District Office in Casper, Wyoming.

Due to their proximity to the existing Buckskin Mine permit area, the entire proposed tract and the southern third (33%) of the general analysis area have been included in annual wildlife surveys for the last 26 years (1984–2009). Approximately 95% of the general analysis area has been surveyed annually for the last eight years (2002–2009) in conjunction with a previous permit amendment at the mine. The entire general analysis area and expanded adjacent lands were included in targeted baseline surveys conducted for the LBA process from late 2007 through 2009.



N

0 5,000 10,000

feet

- Raptor Nest – Intact
- Raptor Nest – Farmer Site
- Sharp-Tailed Grouse Lek – Occupied 2-mile perimeter
- Sage-Grouse Lek – Occupied 3-mile perimeter

B	Buteo Species
BO	Burrowing Owl
FH	Ferruginous Hawk
GE	Golden Eagle
GHO	Great Horned Owl
H	Northern Harrier
RTH	Red-tailed Hawk
SEO	Short-eared Owl
SH	Swainson's Hawk

- Buckskin Mine Permit Boundary
- General Analysis Area
- Applicant Proposed Tract
- BLM Study Area
- 2-Mile Wildlife Survey Perimeter
- Prairie Dog Colony
- County Road
- State Highway

No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 3.10-1

Raptor Nests, Prarie Dog Colonies, and Grouse Leks in the Wildlife Survey Area

Supplemental information on species occurrence and habitat use in the general analysis area was obtained from several sources, including: baseline inventories conducted at the Buckskin Mine from 1977 through 1979 (original study), in 1988 (Spring Draw tract), and from early 1999 through early 2000 (original Hay Creek amendment); annual wildlife monitoring reports submitted to the WDEQ by the Buckskin Mine and overlapping Eagle Butte and Rawhide mines from 1984 through 2009; the *Final Eagle Butte Environmental Assessment* (BLM 1994); the *Final South Powder River Basin Coal EIS* (BLM 2003); the *Final EIS for the West Hay Creek Coal Lease Application* (BLM 2004); the *Final EIS for the Eagle Butte West Coal Lease Application* (BLM 2007e); and from BLM, WGFD, and USFWS records and contacts from 2007 through 2009.

3.10.3. Big Game

3.10.3.1. *Affected Environment*

No crucial big game habitat or migration corridors are recognized by the WGFD in the general analysis area, or elsewhere in the coal mine region of the PRB. Crucial range is defined as any particular seasonal range or habitat component that has been documented as the determining factor in a population's ability to maintain and reproduce itself at a certain level.

The pronghorn (*Antilocapra americana*) and mule deer (*Odocoileus hemionus*) are the only two big game species ever recorded in the general analysis area. No white-tailed deer (*Odocoileus virginianus*) or elk (*Cervus elaphus*) have ever been observed in that area, though both species have rarely been seen within 2 to 3 miles of the general analysis area. The pronghorn is the most common big game species in the general analysis area. However, because the area is dominated by upland grasslands and agricultural lands (71%, combined), this species is not usually observed in great numbers. Pronghorn are most often associated with sagebrush communities, particularly in winter (Sundstrom et al. 1973; Fitzgerald et al. 1994); Big Sagebrush Shrublands comprise less than 11% of both the proposed tract and general analysis area.

The WGFD has classified the habitat in the vicinity of the Buckskin Mine as a mix of yearlong and winter/yearlong pronghorn range. Both range types describe areas where a population or substantial portion of a population of animals makes general use of the habitat on a year-round basis. In yearlong range, pronghorn may occasionally leave the area under severe conditions. In winter/yearlong range, the area receives a predictable and significant influx of additional animals from other seasonal ranges in the winter. The entire general analysis area is within the WGFD's Gillette herd unit. In post-season 2007, the WGFD estimated that population to be 16,823 animals, with an objective of 11,000 (WGFD 2008a). The home range for pronghorn can vary between 400 acres to 5,600 acres. Several factors influence pronghorn movements, including season, habitat quality, population characteristics, water availability, and local livestock occurrence. Typically, daily movement does not exceed 6 miles. Pronghorn may make seasonal migrations between summer and winter habitats, but migrations are often triggered by availability of succulent plants and not local weather conditions (Fitzgerald et al. 1994). As

noted above, no big game migration corridors have been documented in the general analysis area.

Mule deer use a wide variety of habitats, but typically prefer sagebrush-grassland, rough breaks, and riparian bottomland. As described, those habitats are limited throughout the general analysis area. Browse is an important component of the mule deer's diet throughout the year, comprising as much as 60% of total intake during autumn, while forbs and grasses typically make up the rest of their diet (Fitzgerald et al. 1994). This species tends to be migratory in certain areas of the state, traveling from higher elevations in the summer to winter ranges that provide more food and cover. The WGFD has classified the region surrounding the Buckskin Mine as a mix of yearlong and winter/yearlong range for mule deer. The entire area is located within the WGFD's Powder River mule deer herd unit. The agency estimated the 2007 post-season mule deer population for the herd unit at 49,560, which was below the current objective of 52,000 (WGFD 2008a).

White-tailed deer are generally managed separately by the WGFD in the Central herd unit. This deer species prefers treed riparian habitats; no such habitats occur in the general analysis area. The agency classifies nearly the entire area as out of the normal white-tailed deer use range. The nearest known habitat for this species is located in the cottonwood corridor along the Little Powder River, approximately 2 miles east of the general analysis area. White-tailed deer have rarely been recorded outside of that corridor.

A resident elk herd lives in the Rochelle Hills located several miles southeast of the general analysis area. Elk do wander from the protection of the Rochelle Hills to forage in native and reclaimed grasslands at some mines in the central and southern parts of the PRB but they have only rarely been documented within a few miles of the Buckskin Mine. None of the areas considered in this EIS are classified by the WGFD as within normal elk use range.

3.10.3.2. *Environmental Consequences*

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mine-related activities in the support area (241 acres) would have minor to moderate, short-term impacts on pronghorn and mule deer, with long-term impacts on habitat carrying capacity. Activities in the remainder of the overlap area (474 acres) related to mining existing coal leases would have the same impacts as described under the Proposed Action. This alternative would have no impact on elk and white-tailed deer because they are not present in the area.

Mining and reclamation activities would occur incrementally throughout area. Some big game animals would be displaced from portions of the proposed tract, support area, and overlap area to adjacent habitats during mining. Because they are more prevalent, pronghorn would be most affected. However, long-term (since 1984) monitoring at the Buckskin Mine has demonstrated that pronghorn are more common in sagebrush shrubland habitats south of those areas than in the grasslands that dominate them. Similarly, mule deer would experience few impacts, given their infrequent use of these lands and the availability of suitable habitat in adjacent areas that would

remain undisturbed by mining. Big game displacement would be temporary and incremental, occurring over several years and allowing for gradual changes in distribution patterns. Big game living in the areas adjacent to the proposed tract and support area could be adversely affected by increased competition from displaced animals. Noise, dust, and associated human presence would cause some foraging areas adjacent to mining activities to be avoided. However, pronghorn and mule deer have continued to occupy areas within and adjacent to active mining operations, suggesting that some animals do become habituated to such disturbances.

Big game animals are highly mobile and can move to undisturbed areas. The construction of additional fences, spoil piles, and pits related to mining would likely restrict big game movement in or through the proposed tract to some degree. Pronghorn may not be able to negotiate these barriers during severe winter storms. However, WDEQ guidelines require fencing that is designed to permit passage of pronghorn and other big game species to the extent possible.

Changes in big game carrying capacity would be minimal due to the relatively low level of big game use in the area and the current dominance of upland grassland and agricultural habitats in potential impact areas. Mule deer have regularly been documented in reclaimed grasslands at the adjacent Buckskin Mine and elsewhere in the PRB. Long-term restoration of sagebrush and other shrub species would facilitate pronghorn use of reclaimed mine lands over time.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have the same impacts as described under the Proposed Action. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future. This alternative would have no impact on elk and white-tailed deer because they are not present in the area.

Alternative 2

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) and mine-related activities in the support area (926 acres) would have the same impacts on big game during mining and following reclamation as those described under the Proposed Action. Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases also would have the same impacts as those under the Proposed Action. This alternative would have no impact on elk and white-tailed deer because they are not present in the area. Because the general analysis area is dominated (71% combined) by upland grassland communities and agricultural lands, the establishment of reclaimed grassland communities after mining has been completed would represent similar or somewhat improved habitats for big game, respectively, compared to those in the premining landscape. Long-term monitoring conducted at the Buckskin Mine has demonstrated that pronghorn are not common in the grasslands and agricultural lands that dominate the general analysis area. Mule deer are even less abundant in this area; both species use suitable habitat in adjacent areas that would not be affected by either action alternative.

3.10.4. Other Mammals

3.10.4.1. *Affected Environment*

A variety of small and medium-sized mammal species may occur in the general analysis area. Some predators that could be present include the coyote (*Canis latrans*), red fox (*Vulpes vulpes*), and striped skunk (*Mephitis mephitis*). Furbearers common to the area include the bobcat (*Lynx rufus*), long-tailed weasel (*Mustela frenata*), and badger (*Taxidea taxus*). Prey species include various rodents (e.g., mice, rats, voles, gophers, ground squirrels, and chipmunks), cottontails (*Sylvilagus* spp.), and jackrabbits (*Lepus* spp.). These prey species are cyclically common and widespread throughout the region and are important food sources for raptors and other predators.

Because water is extremely limited, species such as the muskrat (*Ondatra zibethicus*), raccoon (*Procyon lotor*), and beaver (*Castor canadensis*) are uncommon throughout the general analysis area. Woodland species such as porcupines (*Erethizon dorsatum*) and bats (e.g., hoary [*Lasiurus cinereus*] and big brown [(*Eptesicus fuscus*]) also have little habitat in the general analysis area. Few of those species have been recorded in the area during the last 26 years of annual monitoring, and those that were observed were not seen with any regularity.

The black-tailed prairie dog (*Cynomys ludovicianus*) is a BLM sensitive species for the Buffalo Field Office due to its periodic occurrence in the federal listing process under the ESA of 1973, as amended. The most recent action regarding this species occurred on December 3, 2009, when the USFWS completed a status review of the black-tailed prairie dog and determined that it does not warrant protection as a threatened or endangered species under the ESA (74 FR 63344). Nevertheless, that agency continues to encourage the protection of prairie dog colonies for their value to the prairie ecosystem and the myriad of species that rely on them.

No prairie dog colonies occur in the proposed tract or general analysis area. The nearest colony is approximately 80 acres in size and is located in a narrow valley on the far side of a ridge that marks the northeastern extent of the general analysis area (map 3.10-1). Because neither action alternative would affect this species, no further discussion is provided for the black-tailed prairie dog in this section.

3.10.4.2. *Environmental Consequences*

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mine-related activities in the support area (241 acres) would have a moderate, short-term impact on small and medium-sized mammals. Activities in the remainder of the overlap area (474 acres) related to mining existing coal leases would have the same impacts as those in the proposed tract and support area. The Proposed Action would have no impact on prairie dog colonies, or species dependent upon water (e.g., muskrats) or extensive woodlands (e.g., porcupines) due to the absence of these habitat types in the affected area.

Mining and reclamation activities would occur incrementally throughout the area. Due to the high reproductive potential of most of these species, small and medium-sized mammals (e.g., lagomorphs, coyotes, and rodents) can quickly recolonize reclaimed lands. Because the proposed tract is dominated (71%) by upland grassland communities, the establishment of reclaimed grassland communities after mining has been completed would not result in a dramatic change in habitat types from the premining landscape.

Medium-sized mammals could be directly affected by collisions with mine-related vehicles or traffic. Species inhabiting disturbed areas would be temporarily displaced to other habitats by mining, potentially resulting in increased competition and mortality, if those habitats are already at their carrying capacity. These populations would rebound as vegetation is reestablished or small mammal prey species recolonize reclaimed areas. Direct losses of small mammals would be higher than for other wildlife because their mobility is more limited and many retreat into burrows when disturbed. Populations of prey animals such as mice, voles, and ground squirrels would decline during mining. However, these animals have a high reproductive potential and tend to reoccupy and adapt to reclaimed areas quickly. Results from research projects on small mammal use of reclamation conducted on mined lands in the Wyoming and Montana PRB have indicated that reclamation objectives to encourage recolonization by small mammal communities are being achieved (Shelley 1992, Clayton et al. 2006).

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have the same impacts as those described under the Proposed Action. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) and mine-related activities in the support area (926 acres) would have a moderate, short-term impact on small and medium-sized mammals. Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases would have the same impacts. This alternative would have no impact on prairie dog colonies. Because Kiewit does not intend to disturb operationally limited lands west of the county roads, Alternative 2 would have no impact on mammalian species dependent upon water or extensive woodlands; such habitats are absent or extremely limited in the affected area.

Because the general analysis area is dominated by upland grassland communities and agricultural lands (71% combined), the establishment of reclaimed grasslands after mining has been completed would represent similar or somewhat improved habitats, respectively, compared to those in the premining landscape.

3.10.5. Raptors

3.10.5.1. *Affected Environment*

Map 3.10-1 shows the locations and physical status of raptor nests identified the general analysis area and baseline survey area for the Buckskin Mine since annual monitoring began at Buckskin and the adjacent mines; the survey areas for adjacent mines overlap that of Buckskin. Over time, new nests have been built, and natural forces have destroyed many nests; others have been relocated for mitigation or removed by mining activities. In some cases, new nests have been created to mitigate the loss of other sites affected by mining operations. Eight intact raptor nests were present in the baseline survey area for raptors in 2008; only three were present in the general analysis area (map 3.10-1). Numerous intact and former nest sites are present elsewhere in the baseline survey area, beyond the general analysis area. Because these nest sites would not be affected by the Proposed Action or Alternative 2, they are not discussed further in this section.

Raptor species that have historically been documented in the general analysis area include the golden eagle (*Aquila chrysaetos*), bald eagle (*Haliaeetus leucocephalus*), ferruginous hawk (*Buteo regalis*), red-tailed hawk (*Buteo jamaicensis*), Swainson's hawk (*Buteo swainsoni*), rough-legged hawk (*Buteo lagopus*), northern harrier (*Circus cyaneus*), American kestrel (*Falco sparverius*), prairie falcon (*Falco mexicanus*), great horned owl (*Bubo virginianus*), and short-eared owl (*Asio flammeus*). These species are year-round residents, seasonal visitors, or migrants, depending on the species. Burrowing owls (*Athene cunicularia*) could nest in old badger burrows, but they have not been recorded doing so in the general analysis area to date. Raptor species such as the northern goshawk (*Accipiter gentilis*), screech owl (*Megascops* spp.), and peregrine falcon (*Falco peregrinus*) are generally precluded due to the lack of appropriate habitats such as dense coniferous forests and riverine cliffs; those species have never been recorded in the general analysis area or at the adjacent Buckskin Mine.

Bald eagles and rough-legged hawks both occur in the vicinity of the Buckskin Mine during winter. The bald eagle is a migrant and common winter resident of the PRB, but is not common in general analysis area. Bald eagle sightings in the general analysis area and at the adjacent Buckskin Mine have not been made with any regularity; observations have averaged less than one bird per year over the last 26 years (1984–2009) and have typically been limited to one or two individuals at a time. Both species occasionally perch in the small grove of trees in the southeastern corner of the proposed tract where it overlaps with the existing permit area and, therefore, are likely to be exposed to disturbance under existing conditions.

On July 9, 2007, the USFWS published a *Federal Register* notice (72 FR 37346–37372) announcing that the bald eagle would be removed from the list of threatened and endangered species under the ESA; delisting was effective on August 8, 2007. However, the protections provided to the bald eagle under the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act will remain in place. The bald eagle is recognized as a BLM sensitive species due to its former listed status and is further discussed in appendix K of this EIS.

The red-tailed hawk and great horned owl are the only two raptor species that nest with any regularity in the general analysis area, including in the proposed tract (map 3.10-1). The golden eagle and short-eared owl have infrequently nested in the general analysis area over time. One pair of Swainson's hawks has periodically built a nest just outside the general analysis area but has never laid eggs. Although nest structures typically associated with ferruginous hawks have been found in the general analysis area, no active nests have been documented during 26 years of annual monitoring. As described previously, habitat is limited or absent for those species that nest exclusively in trees, on cliffs, or in prairie dog colonies. Several pairs of red-tailed hawks and great horned owls have adapted to nesting on mine highwalls and facilities such as coal crushers, silos, and other load-out structures at multiple coal mines in the PRB in recent years. The USFWS does not require mitigation for such nest sites at surface coal mines in northeast Wyoming due to the fact that disturbance activities were ongoing and continuous when raptors arrived to begin nesting.

3.10.5.2. *Environmental Consequences*

Table 3.10-1 presents the potential impacts on raptor nest sites (intact and former) under each alternative.

Table 3.10-1. Potential Impacts on Raptor Nest Sites[a] (Intact and Former) in the General Analysis Area (through 2009) Under the Proposed Action and Alternatives

Species	Alternative 1 (No Action)[b]	Proposed Action	Alternative 2[c]
INTACT NESTS			
Red-tailed hawk	0	0	1
Red-tailed hawk/great horned owl	1	1	1
Ferruginous hawk	0	0	1
Total Intact Nests	**1**	**1**	**3**
FORMER NEST SITES			
Red-tailed hawk/great horned owl	2	2	2
Red-tailed hawk/golden eagle	1	1	1
Golden eagle	1	1	1
Short-eared owl	2	0	2
Total Former Nest Sites	**6**	**4**	**6**

[a] Rows are not summed across.

[b] Nests within the overlap between the general analysis area and existing Buckskin Mine permit area only.

[c] Nest(s) within the general analysis area only (nest number based on maximum potential area of disturbance associated with leasing action).

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mine-related activities in the support area (241 acres) would have no impact on known raptor nest sites, but would have a minor, short-term impact on foraging and nesting habitat. Activities in the remainder of the overlap area (474 acres) related to mining existing coal leases would have a minor, short-term impact on one intact raptor nest and six former nest sites (table 3.10-1, map 3.10-1); four of the six former sites are in the tree shelterbelt in section 19, T52N R72W. These activities would have a minor, short-term impact on nesting and foraging habitat in the overlap area.

The five nest sites in the tree grove have historically been used by red-tailed hawks, great horned owls, and golden eagles, but only hawks and owls have nested in that location since 1998. The eagle pair expanded its territory to the south that year and has not returned to the general analysis area. Short-eared owls nested at the two former sites in the northeastern portion of the overlap area; both sites were last used in 2006.

Long-term monitoring data have demonstrated that the most consistent raptor pairs in the vicinity of the Buckskin Mine regularly nest within 0.25 mile and in view of regular human disturbance; thus, they are acclimated to having some level of activity occur near their nests. For example, one pair of red-tailed hawks nested within 400 feet of an occupied residence and 600 feet from the McGee Road each year from 2002 through 2008, fledging young in all but one year; the nest was tended in 2009. Great horned owls at Buckskin and other PRB mines regularly nest on active mine facilities such as coal crushers and batch load-outs. Details regarding raptor nesting efforts and success near mine operations are available in the Buckskin Mine annual wildlife reports, as well as those for other regional coal mines, on file with the WDEQ in Sheridan, Wyoming.

Despite raptors' apparent acceptance of regular human disturbance near active nests, mining activity could cause them to abandon nests near disturbance, particularly if operations unintentionally encroach on active nests during a given breeding season. Mining activities could also remove intact nests during the non-breeding season. Although these actions could have an impact on individual birds or pairs, mining associated with the Proposed Action would not have an impact on regional raptor populations due to the low level of use by nesting raptors in the area. Prior to any new disturbance associated with the Proposed Action, the current USFWS-approved avian monitoring and mitigation plan for the Buckskin Mine would be updated to incorporate mitigation measures to minimize impacts on nesting raptors (section 3.10.10).

Mining and reclamation activities would occur incrementally throughout the area. Because native habitats in the proposed tract, support area, and overlap area are dominated (71%) by upland grasslands, ground-nesting raptors and those foraging in the area should be able to transition easily to reclaimed grassland parcels. Equipment yards associated with mining provide additional habitat for prey species such as cottontails and rodents. Raptor pairs have voluntarily and repeatedly nested near such areas at Buckskin and other coal mines in the PRB.

Results from annual monitoring of prey populations at these mines have demonstrated that raptor nesting efforts and productivity at surface coal mines in northeast Wyoming have been influenced primarily by natural factors such as prey abundance, untimely inclement weather, and availability of nesting substrates. Due to the limited presence of trees and lack of tall cliffs, raptor species that nest in those features are not as abundant as those that either nest on the ground or are adaptable to nesting on mine facilities or other human-made structures (e.g., platform nests). During mining, new nesting habitat can be created in reclaimed areas through enhancement efforts like the installation of platform nests, relocation of snags, and tree plantings.

Bald eagle sightings in the vicinity of the general analysis area have averaged less than one bird per winter over the last 26 years (1984–2009); no bald eagle nests have ever been documented at the Buckskin Mine. One or two individuals have infrequently been seen perched in the trees in the southeastern corner of the proposed tract during that period, but the tree stand has not officially been classified as a winter roost site. As described previously, those trees are within the overlap area and are already subject to future disturbance and/or appropriate mitigation measures that might be necessary within the existing permit boundary.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have a minor, short-term impact on one intact raptor nest and six former nest sites (table 3.10-1, map 3.10-1); four of the six former sites are in the tree shelterbelt in section 19, T52N R72W. These activities would have a minor, short-term impact on nesting and foraging habitat in the overlap area. The raptor mitigation plan for the mine would continue to be updated according to current permit requirements (every term of permit renewal or major change in the mine plan) to ensure protection of nesting raptors in the vicinity of the mine. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

As described under the Proposed Action, red-tailed hawks, great horned owls, and golden eagles have historically nested in the tree grove that also falls within the proposed tract, but only hawks and owls have nested there since 1998. Short-eared owls have nested elsewhere in the overlap area, but those ground nests do not normally persist beyond the year they are used and have already been disturbed by previously permitted mine operations within the overlap area. Mining and reclamation activities would occur incrementally throughout the area. Because native habitats in the area dominated (71%) by upland grassland species, ground-nesting raptors and those foraging in the area would be able to transition easily to reclaimed parcels. If new nests are discovered in the overlap area in the future, the USFWS would be contacted to incorporate the site into the approved raptor mitigation plan for the Buckskin Mine.

Alternative 2

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) would have a minor, short-term impact on one intact raptor nest (map 3.10-1). Mine-related activities in the support area (926 acres) also would have a minor, short-term impact on one intact raptor nest. Activities

in the BLM study area and support area would have a minor, short-term impact on raptor foraging and nesting habitat. Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases would have a minor, short-term impact on one intact raptor nest and six former nest sites (table 3.10-1, map 3.10-1); four of the six sites are in the tree shelterbelt in section 19, T52N R72W. These activities would have a minor, short-term impact on nesting and foraging habitat in the overlap area.

Mining and reclamation activities would occur incrementally throughout the area. Because the general analysis area is dominated (71% combined) by upland grassland communities and agricultural lands, the establishment of reclaimed grassland communities after mining has been completed would represent similar or somewhat improved habitats, respectively, compared to premining conditions. These reclaimed areas would provide alternate nesting and/or foraging habitats for local raptors.

Two stands of trees, beside the one in the overlap area, are present in the general analysis area; both are located adjacent to currently or recently occupied residences. Red-tailed hawks were first documented nesting near an occupied residence located between the McGee and Collins roads in 2002; the pair fledged two young that year. Hawks nested in that shelterbelt in each of the subsequent six years, despite increased activity at the residence in recent years; young fledged in five of those six years. No raptor nests have been documented in the shelterbelt near the recently vacated residence west of the junction of these roads. The lone intact ferruginous hawk nest in the general analysis area (map 3.10-1) has never been active since it was discovered in 1999. No active nests for this species have ever been recorded near the Buckskin Mine during the last 26 years of annual monitoring, although the presence of ground nests that are characteristic of ferruginous hawks suggests historic nesting activity. These ground nests can persist for many years without use as a result of the dry climate.

Three additional intact raptor nests are located beyond, but within 0.5 mile of the general analysis area (map 3.10-1); that is the distance recognized by the BLM as an adequate buffer between disturbance and nests of most raptor species. All three structures have been classified as ferruginous hawk nests due to their physical locations and composition, but none have been active since their respective discoveries. One of those three nests is in the existing mine permit area (beyond the overlap area), and will be affected under any alternative. The remaining two nest sites are approximately 0.5 mile north of the general analysis area. These nests are separated from the general analysis area by multiple ridges and, thus, are buffered from future visual and audio disturbance in that area.

As described in chapter 2, Kiewit does not anticipate relocating either county road. Should those areas be leased and scheduled for disturbance, the Buckskin Mine would be required to revise its monitoring and mitigation plan to provide adequate protection from new mine-related disturbances for nesting or roosting raptors (section 3.10.10). Prior to any new disturbance associated with the Proposed Action, the current USFWS-approved avian monitoring and mitigation plan for the Buckskin Mine would be updated to incorporate mitigation measures to minimize impacts on nesting raptors (section 3.10.10).

3.10.6. Upland Game Birds

3.10.6.1. *Affected Environment*

Upland Game Birds

Four upland game bird species are known to occur in suitable habitats in the general analysis area: the mourning dove (*Zenaida macroura*), gray partridge (*Perdix perdix*), sharp-tailed grouse (*Tympanuchus phasianellus*), and greater sage-grouse (*Centrocercus urophasianus*), hereafter referred to as sage-grouse. Although all four species have been documented in and around the general analysis area over time, sightings typically consisted of fewer than 10 birds at a given location.

The mourning dove is the most common upland game bird species in the vicinity of the Buckskin Mine. Doves are especially abundant during spring and fall migrations, with fewer observations during the nesting season. This species is also a relatively common breeding bird in Campbell County and may be found in a variety of habitat types (Cerovksi et al. 2004). Doves are often seen near sites with water sources and trees, though they are occasionally observed in sagebrush and greasewood stands. Mourning doves were recorded in the general analysis area, including in the proposed tract, during baseline surveys conducted in both 2007 and 2008, and in previous and subsequent years. Individuals observed in the proposed tract were most often associated with the small stand of trees in the southeastern corner that overlaps the existing Buckskin permit area.

The gray partridge (a.k.a. Hungarian partridge or Hun) is an introduced, non-migratory game bird that forms flocks (or coveys) outside the breeding season. Gray partridge have observed along the reclaimed channel of Rawhide Creek inside the existing Buckskin permit area; that area is approximately 1.5 miles southeast of the general analysis area. However, this species is not encountered with any regularity, with intervals of several years passing between sightings. No gray partridge were observed in the general analysis area during 2007 or 2008.

The greater sage-grouse is a species of concern throughout the West and, as such, is given greater consideration in this EIS. Although the sharp-tailed grouse does not have the same status as sage-grouse, it has been documented at the Buckskin Mine over the years. Surveys for both species are conducted using the same timing and protocols. Consequently, portions of the following discussion apply to both species. Individual discussions are provided by species, where appropriate.

Grouse Terminology and Survey Methods

The WGFD manages and regulates grouse populations in Wyoming, while the WDEQ regulates surface coal mines in the state. Survey protocols for grouse used at Buckskin and other coal mines in northeast Wyoming are based on Appendix B of the WDEQ Coal Rules and Regulations. The wildlife survey and reporting protocols in this document are based on input and guidance provided by the WGFD. Those protocols are used during all baseline and annual

monitoring efforts conducted at surface coal mines in the Wyoming PRB. For consistency with those efforts, WGFD nomenclature for leks and their management status is used in this EIS.

A lek is defined as a traditional courtship display area attended by male grouse (WGFD 2006). For sage-grouse, leks are typically located in sagebrush dominated habitats. Sharp-tailed grouse leks can be found in both grassland and sagebrush habitats. The WGFD designates display sites as leks based on observations of two or more male grouse engaged in courtship displays made on two separate occasions during the appropriate time of day (WGFD 2006). Sub-dominant males may display on temporary strutting areas during population peaks, but those areas usually fail to become established leks. Therefore, the WGFD requires sites where small numbers (less than five) of males are observed strutting to be confirmed as active for two years before adding the site to the lek database. A group of leks in close enough proximity for males to move among them from one day to the next is considered a lek complex. A specific distance criterion to define a complex does not yet exist (WGFD 2006).

The WGFD has adopted definitions for lek status to provide consistency in nomenclature when collecting and reporting sage-grouse data (WGFD 2006). The definitions describe the annual status and a long-term management status of sage-grouse leks; those definitions can also be applied to sharp-tailed grouse leks. The status is assessed annually based on the following definitions:

- Active—any lek that has been attended by male grouse during the strutting season.
- Inactive—any lek where sufficient data suggests that there was no strutting activity throughout a strutting season.
- Unknown—leks for which status as active or inactive has not been documented during the course of a strutting season.

The WGFD management status is based on a lek's annual status, and includes three categories:

- Occupied—a lek that has been active during at least one strutting season within the prior 10 years. Occupied leks are protected through prescribed management actions during surface-disturbing activities.
- Unoccupied (formerly "historical lek")—This category is further divided into two sub-groups: "destroyed" and "abandoned." Unoccupied leks are not protected during surface-disturbing activities.
    - Destroyed—A formerly active lek site and surrounding habitat (including sagebrush) that have been destroyed and are no longer suitable for grouse breeding.
    - Abandoned—A lek in otherwise suitable habitat that has been "inactive" during the most recent 10 consecutive strutting seasons.
- Undetermined—Any lek that has not been documented as active in the last 10 years, and for which survey information is insufficient to designate it unoccupied. Undetermined leks are protected through prescribed management actions during surface-disturbing activities until sufficient documentation is obtained to confirm the lek is unoccupied.

The Buckskin Mine has conducted surveys of known grouse leks and searches for new leks as part of its wildlife baseline inventories and annual wildlife monitoring programs since the late 1970s and mid 1980s, respectively. Baseline inventories, which occurred prior to initial permitting and subsequent permit amendments, encompassed the mine's permit area and the area within a 2-mile radius. Lek counts have been conducted in the Buckskin Mine permit area and the area within a 1-mile radius as part of the annual monitoring program for the last 26 years (1984–2009). The annual monitoring area was expanded to accommodate each new amendment as it was approved. Due to the proximity of the proposed tract to the existing mine, the entire proposed tract and most of the general analysis area have been included in previous survey efforts since 1984.

Annual lek counts were voluntary until 1993, when the WDEQ issued the monitoring guidelines (Appendix B of the WDEQ Coal Rules and Regulations). Counts are conducted at 7- to 10-day intervals over a 3- to 4-week period from early April through early May each year per WGFD (2006) survey protocols. Surveys are conducted from the ground between 0.5 hour before sunrise and one hour after sunrise, and only during appropriate weather conditions (i.e., light wind and no precipitation). Each lek site is checked at least once in spring, with active leks counted at least three times. Repeated counts of males and females are made at each site until a consistent peak count is recorded.

Specific surveys for nesting and wintering grouse are not part of the annual monitoring requirements for surface coal mines in the Wyoming PRB. However, seasonal ground surveys for other wildlife species have been conducted in potential grouse nesting habitats annually since 1984, including numerous walking surveys in sagebrush and other habitats targeting other ground-nesting species each spring. Surveys for winter grouse use have been conducted as part of the required baseline inventories for previous and proposed permit amendments over the years. Biologists conducted the surveys by driving and walking through sagebrush habitats watching for grouse and their sign (snow tracks, droppings, feathers) during winter months. Sage-grouse were also recorded during other wildlife surveys described in this section.

Targeted surveys for sage-grouse broods were conducted as part of the required annual monitoring program twice each July from 1995 through 1999. Based on the lack of brood sightings at coal mines throughout the region, the WGFD recommended in 1999 that surveys for grouse broods be dropped from annual monitoring requirements under Appendix B of the WDEQ Coal Rules and Regulations. The Buckskin Mine voluntarily continued brood surveys through summer 2001 before amending its WDEQ mining permit to remove that survey requirement. Due to the increasing concern about the sage-grouse throughout its range, the mine voluntarily conducted grouse brood surveys annually from 2004 through 2009. All surveys were conducted by walking along approximately 4 miles of native and reclaimed drainages (2 miles each) within the existing Buckskin Mine permit area and recording any grouse or grouse sign observed. Similar surveys were conducted in drainages within proposed expansion areas over the years as part of baseline inventory requirements. Coincidentally, some survey routes included drainages within the general analysis area. Biologists also watched for and recorded any sage-grouse and broods seen incidental to other wildlife surveys during all monitoring years.

Sage-Grouse Life History

The sage-grouse is considered a "landscape species," which means that large expanses of unfragmented land are required to provide all the habitat components necessary for their annual life cycle. This species is a sagebrush-obligate, and requires sagebrush habitat year-round for food, cover, and shelter, and for every phase of its life cycle. Sage-grouse often exhibit seasonal movements to use discrete sagebrush habitats, though the distance traveled varies widely among populations. These movements are often in response to devotion to seasonal-use areas (i.e., breeding, nesting/brood rearing, summering, and wintering), with adjustments related to severity of winter weather, topography, and vegetative cover.

Sage-grouse breeding occurs on leks during late March and April. Leks are generally established in open areas surrounded by Wyoming big sagebrush (*Artemisia tridentata wyomingensis*), which is used for escape cover and protection from predators. Generally, lek sites are used year after year and are considered the center of year-round activity for resident sage-grouse populations. On average, approximately two-thirds of sage-grouse hens nest within 3 miles of the lek where they were bred. New spring plant growth, residual cover, and understory are important habitat components for nesting sage-grouse hens.

Areas near nests are used for several weeks by hens for brood rearing. The habitats used during the first few weeks after hatching must provide both good cover to conceal the chicks and essential nutritional requirements during this period of rapid development. Brood-rearing habitats that have a healthy and wide diversity of plant species, particularly grasses and forbs, tend to provide the variety and abundance of insects that are an essential protein supply for the young birds.

Summer habitat consists of sagebrush mixed with areas of wet meadows, riparian, or irrigated agricultural fields. As summer progresses and forbs mature and dry up, sage-grouse broods must move to more mesic or wet meadow-type habitats where succulent plants and insects are still available. This can be especially important in drier years and during extended periods of drought. As the fall season nears, sage-grouse form flocks as brood groups come together. As fall progresses, sage-grouse move toward their winter ranges.

During winter, sage-grouse feed almost exclusively on sagebrush leaves and buds. Suitable winter habitat requires sagebrush to be accessible, especially in areas where snowfall is common. It is crucial that sagebrush be exposed at least 10 to 12 inches above snow level, as this provides food and cover for wintering sage-grouse. Population and habitat analyses suggest that wintering habitat can be as limiting as breeding habitats.

Regional and Statewide Sage-Grouse Population Trends

Overall, the sage-grouse population has been steadily declining in Wyoming and across the rest of the West. A study prepared by the Western Association of Fish and Wildlife Agencies estimated that sage-grouse populations in western North America declined at an overall rate of 2% per year from 1965 to 2003 (Connelly et al. 2004). The decline rate was greater from 1965 to 1985, with populations stabilizing and some increasing from 1986 to 2003. For Wyoming,

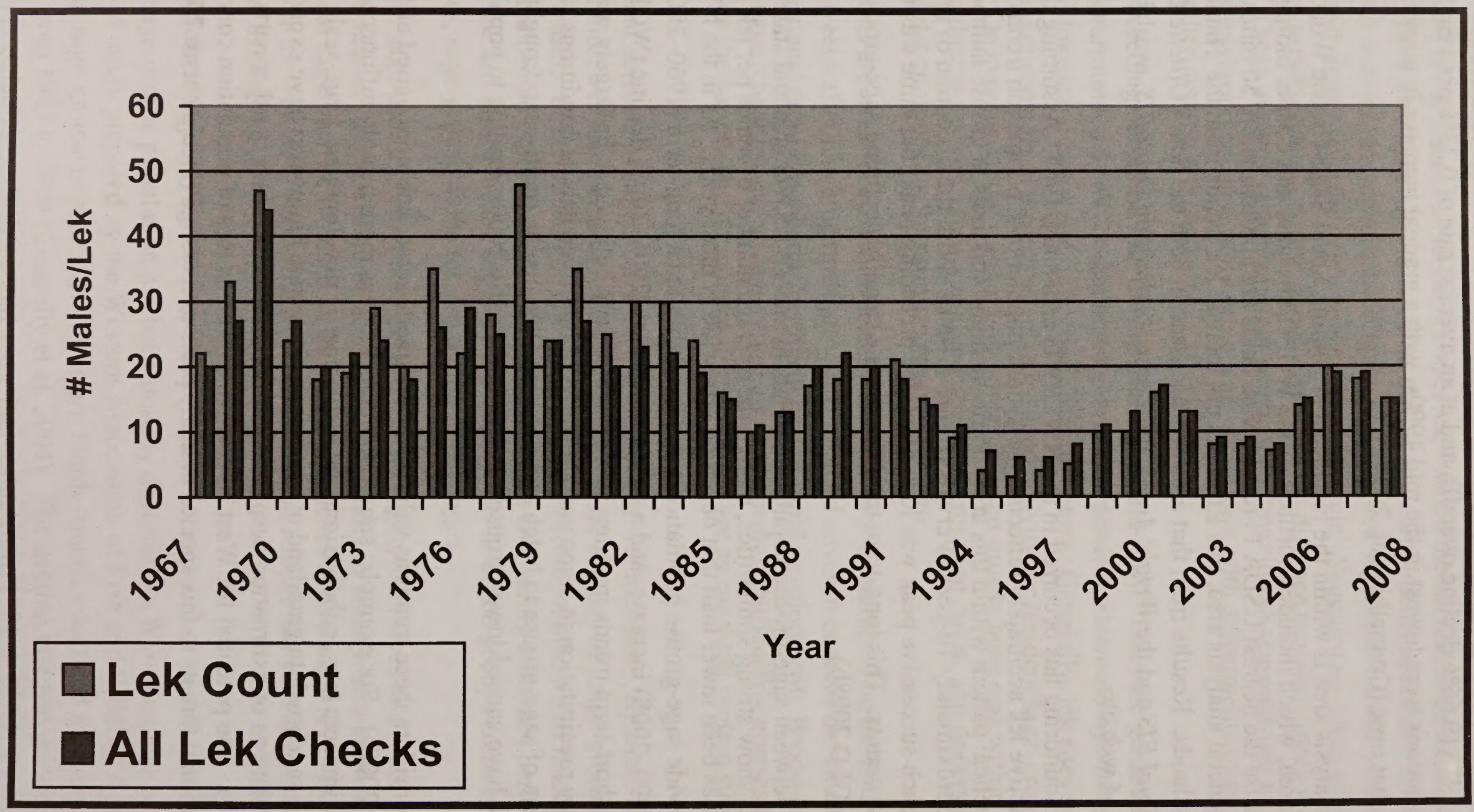
this study estimated that sage-grouse populations declined at an average rate of 0.51% per year from 1968 to 1986 (9.66% decline overall), and at an average rate of 0.33% per year from 1987 to 2003. Populations were lowest in the mid 1990s, with a gradual increase in numbers in some regions since that time (Connelly et al. 2004).

The general analysis area is within the Northeast Wyoming Local Sage-Grouse Working Group (NWLSWG) area, which includes portions of the WGFD Sheridan and Casper biological regions. Because the nearest USDA Forest Service lands are approximately 50 miles north and south of the general analysis area, this EIS does not include lek trends from the Thunder Basin National Grasslands. Results from that area are discussed in both the *South Gillette Coal Lease Application Final EIS* and the *Wright Area Coal Lease Application Draft EIS*, available on the Wyoming BLM website.

Sage-grouse monitoring has occurred in the NWLSWG area since 1967. Assuming the number of males per active lek accurately reflects sage-grouse populations, population trends have exhibited a cyclical pattern within this area. Periodic highs and lows in grouse numbers have occurred at approximately 10-year intervals (figure 3.10-1). With the exception of the most recent cycle, each successive peak was lower than the preceding peak; the same was true for successive low counts. This long-term trend suggests a steadily declining sage-grouse population (WGFD 2008b).

Comparisons between sage-grouse population trends in the NWLSWG area and statewide (figure 3.10-2) show strong similarities, though the average number of males per lek in the regional area has been lower than that observed statewide in most years. As in the NWLSWG area, the statewide sage-grouse population trend has exhibited a long-term (1960–2008) decline, a mid-term (1999–2008) increase, and a recent short-term (2006–2008) decline (WGFD 2008c). The mid- and short-term trends in statewide populations are believed to be largely weather related. Timely precipitation in some years resulted in improved habitat conditions, allowing greater numbers of sage-grouse to hatch and survive. Conversely, multi-year drought conditions are believed to have caused lower grouse survival in the early 2000s, leading to population declines.

The WGFD considers these trends as valid at the statewide scale, but more varied at the local scale (WGFD 2008c). For example, sub-populations in areas more heavily influenced by anthropogenic impacts (e.g., subdivisions, intensive energy development, large-scale conversion of habitat from sagebrush to grassland or agriculture, interstate highways) have experienced declining populations or extirpation despite recent population increases in other parts of the state (WGFD 2008c). The potential for West Nile virus, as well as loss of population connectivity, represent additional threats to this species in many parts of its range (Naugle et al. 2004).

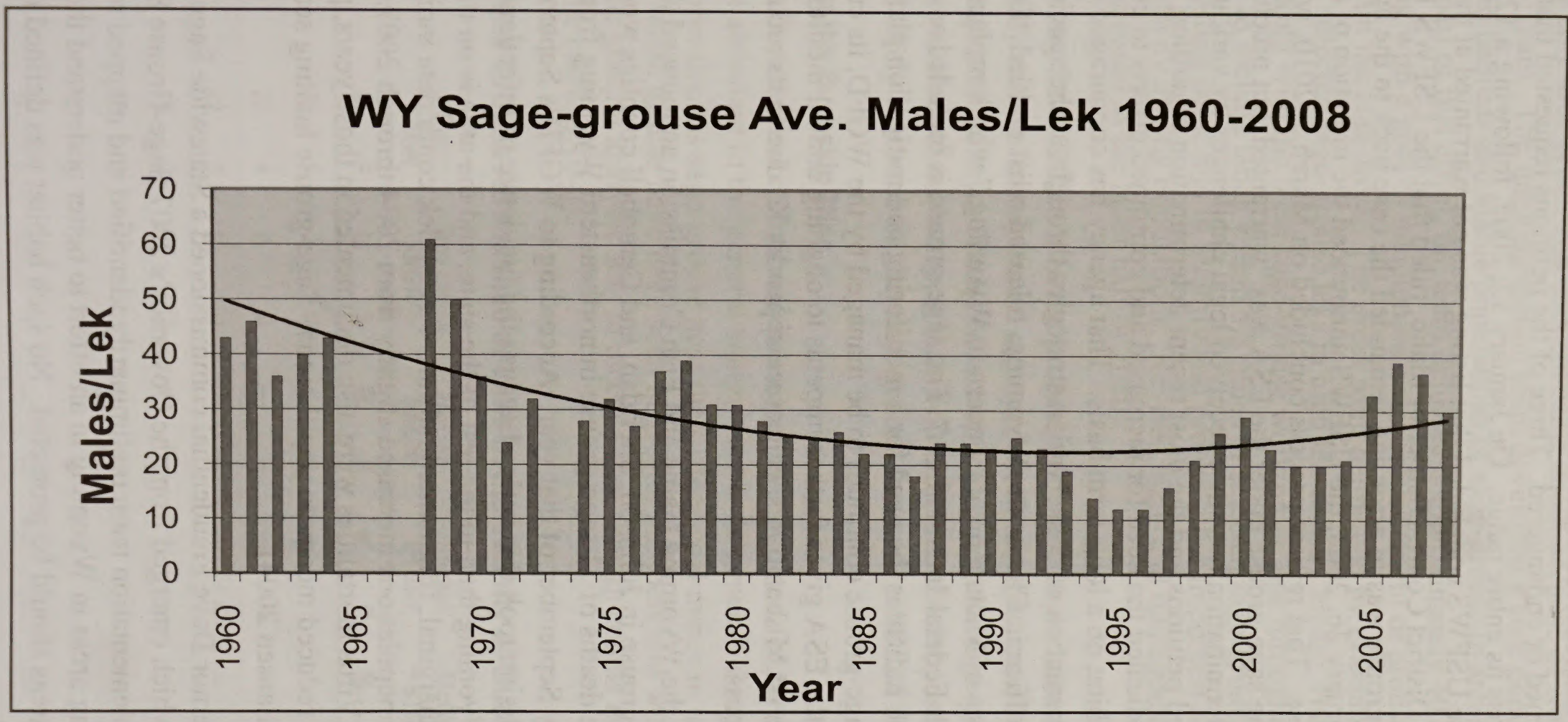


Source: Northeast Wyoming Local Working Group Area, Annual Sage-Grouse Completion Report For 2008

No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Figure 3.10-1

Average Male Sage-grouse Lek Attendance within the Northeast Wyoming Local Working Group Area (1967–2008)



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Figure 3.10-2

Average Number of Males per Lek Counted in Wyoming (1960–2008) with a Minimum of 100 Leks Checked Each Year

Agency Responses to Sage-Grouse Population Trends

Since 1999, the USFWS has received eight petitions requesting that the sage-grouse be listed under the ESA as threatened or endangered. Three of the petitions requested that sage-grouse be listed as endangered across its entire range. On January 12, 2005, following a 12-month status review on the species, the USFWS concluded that listing was not warranted at that time. On December 4, 2007, U.S. District Court, District of Idaho, ruled that the USFWS 12-month petition finding on sage-grouse was in error and remanded the case back to the agency for further reconsideration. On February 26, 2008, the USFWS announced the initiation of another status review for the sage-grouse. That review process concluded on March 5, 2010, when the agency determined that listing the sage-grouse under the ESA was "warranted, but precluded" by other higher priorities; that determination has since received legal challenges by various groups. In response to these repeated petitions and the most recent determination regarding listing under the ESA, the USFWS has indicated the need for increased and continued efforts to conserve sage-grouse and sagebrush habitat on a long-term basis. That agency has encouraged continued development and implementation of conservation strategies throughout the species' range. In May 2002, the USFWS office in Cheyenne, Wyoming, released a list entitled "Coal Mine List of 40 Migratory Bird Species of Management Concern in Wyoming," which replaced the previous "Migratory Birds of High Federal Interest List." The sage-grouse is included as a Level I species on the updated list, which indicates the need for a monitoring and mitigation plan for this species. Although the sage-grouse continues to be managed by the WGFD, its current status as a candidate species under the ESA gives further impetus to ongoing annual monitoring efforts. The sage-grouse is also a BLM sensitive species (see appendix K) due to its recurring presence in the federal listing process.

On September 11, 2003, the Wyoming Game and Fish Commission announced that the 2003 hunting season for sage-grouse in Johnson, Sheridan, and Campbell counties would be closed. The closure followed the deaths of 11 sage-grouse in northeastern Wyoming from West Nile virus in August and early September of that year. According to WGFD's September 11, 2003, press release, the commission took this action because the incidence of infection was much higher in northeastern Wyoming than in the rest of the state, and the area is on the fringe of sage-grouse range with marginal, fragmented habitat. Recent lek count data indicate that Wyoming's sage-grouse populations increased slightly from 2004 through 2007. Lower incidences of West Nile Virus mortalities were also documented in those years, primarily due to cooler temperatures that reduced mosquito populations. Sage-grouse hunting seasons were reopened in 2004 (Christiansen 2004).

In 2007, Wyoming Governor Dave Freudenthal commissioned a Statewide Sage-grouse Implementation Team, which emerged from the Governor's 2007 Sage-Grouse Summit. On March 17, 2008, the implementation team preliminarily identified and mapped recommended sage-grouse core breeding areas in Wyoming in an effort to better understand the types of habitat grouse prefer and what areas should be protected. No such habitat was defined in the vicinity of the general analysis area.

On August 1, 2008, the Governor of Wyoming released an executive order regarding sage-grouse core area protection (Office of the Governor of Wyoming 2008) on state trust lands. The sage-grouse core area protection concept came about because of work by the Sage-Grouse Implementation Team. The implementation team developed a core population strategy for the state "to maintain habitats and viable populations of sage-grouse in areas where they are most abundant." As part of that effort, the team delineated approximately 40 areas of state trust lands around Wyoming with a goal of maintenance and enhancement of grouse habitats and populations within the core areas. The areas were delineated by evaluating habitats within a 4-mile radius of selected sage-grouse leks in high lek-density areas. The Implementation Team is currently working with the local sage-grouse working groups throughout Wyoming to revise those core areas to include lands within 5.3 miles of selected sage-grouse leks to increase protection for nesting hens, and to identify and protect other important habitats that might help maintain connectivity among populations. Revised maps and management recommendations are expected to be released in the latter half of 2010.

The BLM Wyoming State Office is in the process of developing a statewide sage-grouse management policy and has incorporated sage-grouse focus areas based on the core area concept in the draft management policy. The BLM has indicated that the sage-grouse management strategy for future surface disturbance, which would include the Proposed Action and alternatives, will likely be based on the sage-grouse focus areas (BLM 2008d).

Grouse History at the Buckskin Mine

Based on results from annual counts and lek searches conducted for the Buckskin Mine, grouse occur but are not abundant in the general analysis area. In general, sharp-tailed grouse do not appear to be as prevalent as sage-grouse near the surface coal mines in northeast Wyoming. However, sharp-tailed grouse have been seen in greater numbers and with more frequency than sage-grouse in the general analysis area in recent years, though counts for both species have declined over time (table 3.10-2).

Table 3.10-2. Peak Grouse Attendance at Leks in the Vicinity of Buckskin Mine (1984–2009)

	Daly SAGR		Hay Creek SAGR[a,b]		McGee SAGR[c]		Stickel STGR[b]		McGee I STGR		McGee II STGR[b]		McGee III STGR[d]	
Year	M	F	M	F	M	F	M	F	M	F	M	F	M	F
1984	20	1	2	U	—	—	—	—	—	—	—	—	—	—
1985	20	4	8	U	—	—	—	—	—	—	—	—	—	—
1986	12	0	12	U	—	—	—	—	—	—	—	—	—	—
1987	10	0	23	U	—	—	—	—	—	—	—	—	—	—
1988	17	0	27	U	—	—	—	—	—	—	—	—	—	—
1989	16	5	15	1	—	—	—	—	—	—	—	—	—	—
1990	9	1	12	1	—	—	—	—	—	—	—	—	—	—
1991	10	1	17	0	—	—	—	—	—	—	—	—	—	—

Table 3.10-2. Continued

	Daly SAGR		Hay Creek SAGR[a,b]		McGee SAGR[c]		Stickel STGR[b]		McGee I STGR		McGee II STGR[b]		McGee III STGR[d]	
Year	M	F	M	F	M	F	M	F	M	F	M	F	M	F
1992	7	1	20	5	—	—	—	—	—	—	—	—	—	—
1993	0	0	U	U	—	—	—	—	—	—	—	—	—	—
1994	0	0	U	U	—	—	—	—	—	—	—	—	—	—
1995	0	0	0	0	—	—	—	—	—	—	—	—	—	—
1996	0	0	0	0	—	—	—	—	—	—	—	—	—	—
1997	0	0	0	0	—	—	—	—	—	—	—	—	—	—
1998	0	0	0	0	—	—	—	—	—	—	—	—	—	—
1999	0	0	0	0	—	—	—	—	5	0	—	—	—	—
2000	0	0	0	0	—	—	13	1	8	0	—	—	—	—
2001	0	0	2	3	6	2	9	3	4	0	—	—	—	—
2002	0[e]	0	0	0	0	0	3	0	0	0	13	5	—	—
2003	0	0	0	0	1	3	0	0	0	0	8	1	—	—
2004	0	0	0	0	3	0	0	0	0	0	2	0	—	—
2005	0	0	0	0	0	0	0	0	0	0	0	0	4[f]	0
2006	0	0	0	0	U	U	0	0	0	0	0	0	0	0
2007	0	0	U	U	U	U	U	U	0	0	0	0	0	0
2008	0	0	0	0	0	0	U	U	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mgt. Status[g]	Abandoned		Occupied		Occupied		Occupied		Occupied		Occupied		Occupied	

SAGR = sage-grouse; STGR = sharp-tailed grouse; M= Male; F = Female; U = Unknown, lek inaccessible due to mining; — = lek undiscovered

[a] The lek was beyond the required annual monitoring area until 2002 but was checked at least once in most years.

[b] In the Buckskin Mine permit area.

[c] The lek is beyond the required annual monitoring area; data presented is from the 2009 WGFD lek database.

[d] In the general analysis area.

[e] Two displaying males were seen once approximately 1,000 feet south of the historic lek site. The birds were presumed to have flown in from another lek located 2.0 miles south of the Daly lek site.

[f] Birds were not displaying; number of males and females unknown.

[g] Management status based on WGFD (2006) classifications.

Four sharp-tailed grouse leks have been identified in the vicinity of the Buckskin Mine (table 3.10-2). All four are considered occupied under the WGFD management status classification system, though they have all been inactive for the last few years. No sharp-tailed grouse have ever been observed on the proposed tract, though flocks of as many as a dozen birds have infrequently been recorded in the winter feeding in fallow agricultural fields and perched in the tree shelterbelt near the junction of the Collins and McGee roads within the general analysis area. No sharp-tailed grouse have been seen in those locations since at least 2003. No nests or young of this species have ever been documented in the vicinity of the Buckskin Mine.

As indicated, no sharp-tailed grouse leks are present in the proposed tract. Two leks (McGee II and McGee III) are located in the general analysis area. The McGee II lek is in the overlap with the existing Buckskin Mine permit area, and the McGee III lek is immediately north of that boundary (map 3.10-1). The McGee I sharp-tailed grouse lek is approximately 0.25 mile north of the general analysis area, on the far side of a ridge and approximately 50 feet from the McGee Road. The Stickel lek is in the existing permit area, approximately 0.75 mile southeast of the general analysis area; that lek has been or will be affected by previously permitted mine disturbance.

The greatest number of male sharp-tailed grouse recorded in the vicinity of the mine in a given year occurred in 2000, when 13 birds were seen at the Stickel lek and 8 were observed at the McGee I lek (table 3.10-2). However, sharp-tailed grouse counts declined steadily after 2000, and none were found during any lek monitoring or search efforts conducted after 2005. Given the proximity of the three McGee lek sites to one another, and the fact that grouse were never seen at two leks within that complex in the same year, it is likely that the birds were merely shifting their display sites periodically based on vegetative conditions or other unknown factors, while remaining in the same general area. Similar occurrences at sharp-tailed grouse leks have been observed elsewhere in the region. The Stickel lek may have been part of the McGee complex as well.

Three sage-grouse lek sites have been documented at the Buckskin Mine over the last 26 years of annual monitoring (table 3.10-2); none of these sites is within the general analysis area (map 3.10-1). The Daly sage-grouse lek has been inactive for the last 16 consecutive years and is considered abandoned by the WGFD. The remaining two leks have also been inactive in recent years, but are still classified as occupied. The Hay Creek lek is within the existing Buckskin Mine permit area, approximately 0.5 mile southeast of the general analysis area. This site has been or will be affected by previously permitted disturbance in the permit area. The McGee sage-grouse lek is approximately 1.25 miles north of the general analysis area, and the abandoned Daly lek site is approximately 0.75 mile west of the permit area and on the far side of U.S. Highway 14-16.

The Daly sage-grouse lek has been monitored annually since 1984 (table 3.10-2). The greatest number of males recorded there was 20 in both 1984 and 1985. Peak male counts vacillated over the next seven years, but attendance gradually declined through 1992. No grouse were observed at the lek itself from 1993 through 2009. Two males were seen displaying approximately 1,000 feet south of the historic Daly lek site on one occasion in late April 2002, but no grouse were recorded in that area during any subsequent surveys. Those two birds were presumed to have flushed from an active lek site approximately 2 miles south of the Daly lek.

The Hay Creek sage-grouse lek is located in the northeastern corner of the existing Buckskin Mine permit area. The lek was active every year from 1984 through 1992, with a peak count of 27 males in 1988. The site was not visited in 1993 or 1994, but no birds were observed during periodic checks from 1995 through 2000. Through 2000, the lek site was beyond the required annual monitoring area (existing permit boundary and 1-mile radius) for the Buckskin Mine; the

mine surveyed the lek voluntarily during this period. Annual monitoring of the Hay Creek lek resumed from 2001 through 2009. Two displaying males and three hens were seen at the lek on one morning in 2001, but no grouse were present during subsequent checks that year, or in the following seven years.

The McGee sage-grouse lek is located beyond the required annual monitoring area for the Buckskin Mine and, therefore, is not included in that monitoring program. A WGFD biologist first recorded the lek in 2001. Biologists with that agency monitored the lek each year through 2005, and again in 2008; biologists with ICF monitored the lek in 2009. The peak male count during that period was the original six birds discovered in 2001. No grouse were seen at the McGee sage-grouse lek during four of the seven survey years, though the landowner reported birds present there in 2008 (the WGFD count was zero during three separate counts that year).

No grouse nests have been encountered in the general analysis area. No grouse broods for either species were recorded in the general analysis area during targeted surveys or incidental to surveys for other species. No sage-grouse have been observed during winter, though site visits occur less often at that time of year. No sharp-tailed grouse have ever been observed on the proposed tract during any season, though flocks of as many as a dozen birds have infrequently been recorded in the general analysis area, feeding in fallow agricultural fields and perched in the tree shelterbelt near the junction of the Collins and McGee county roads in winter. No sharp-tailed grouse have been seen in those locations since at least 2003.

As described in section 3.10.1, sagebrush habitat is limited to 302 noncontiguous acres in the general analysis area (including 46 noncontiguous acres in the proposed tract) with average patch size of 4.9 acres. These acreages represent less than 11% of the total vegetative cover for each respective area. Water sources in the general analysis area are limited to the diverted channel of the ephemeral drainage of Hay Creek, two small impoundments, and a playa. Of those, only one small impoundment is present in the proposed tract itself. All water bodies are seasonal, with water typically present in spring but dry by mid- to late summer.

3.10.6.2. *Environmental Consequences*

Given the dominant vegetation types in the general analysis area (upland grasslands and agricultural fields) and the lack of regular sightings over the last 26 years of monitoring, especially outside the breeding season, it is unlikely that either the sharp-tailed grouse or sage-grouse is a yearlong resident of the general analysis area. The WGFD stated in a letter to the BLM, dated May 6, 2010, that it has no concerns about terrestrial wildlife, including sage-grouse, pertaining to the Hay Creek II LBA coal lease application.

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mine-related activities in the support area (241 acres) would have no physical impact on grouse leks (map 3.10-1). This alternative would have a minor, long-term impact on approximately 46 non-contiguous acres of potential sage-grouse nesting habitat (sagebrush) in these areas. Activities in the remainder of the overlap area (474 acres) related to mining existing coal leases

also would have no impact on sage-grouse leks, but would have a moderate, long-term effect on one sharp-tailed grouse lek (map 3.10-1), and a minor, long-term impact on approximately 80 non-contiguous acres of potential sage-grouse nesting habitat (sagebrush).

No grouse leks, nests, broods, or other signs of use (feathers, droppings, and snow tracks) have been documented within the proposed tract during the last 26 years of monitoring. The proposed tract, support area, and overlap area do not provide any unique habitat for either grouse species. This combined area is dominated (71%) by upland grasslands. Sagebrush occurs on approximately 126 non-contiguous acres, with an average patch size of 4.9 acres. Impacts from mine-related noise would be minor and short-term due to the presence of natural buffers between mine activities and lek sites, and the temporary and incremental presence of operations in any given location.

The mourning dove is the only species ever recorded in the proposed tract. Mining the proposed tract would affect known habitat for mourning doves, and potential habitat for gray partridge, sharp-tailed grouse, and/or sage-grouse to varying degrees. For example, the prevalence of grasslands and limited presence of surface water in the proposed tract limit its value to sagebrush-obligates such as the sage-grouse. The only group of trees (potential habitat for doves and roosting sharp-tailed grouse) in the proposed tract falls within the overlap area and, thus, would be disturbed by previously permitted activities. The upland grasslands that dominate the proposed tract are better suited for gray partridge, an introduced species, but no partridge have been documented in the proposed tract. Because the proposed tract is dominated by upland grasslands, the establishment of reclaimed grassland communities after mining has been completed would not result in a dramatic change in habitat types from the premining conditions.

Some evidence has been documented that sage-grouse do repopulate areas after reclaimed shrublands have become established, but that process may take decades (Braun 1998). Estimates for the time it would take to restore shrubs, including sagebrush, to premine density levels range from 20 to 100 years, which may delay sage-grouse repopulation in the reclaimed areas. Once they do return to an area, sage-grouse populations do not appear to attain their previous levels.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have no physical impact on sage-grouse leks, but would have a moderate, long-term effect on one sharp-tailed grouse lek (map 3.10-1), and a minor, long-term impact on approximately 86 non-contiguous acres of potential sage-grouse nesting habitat (sagebrush). Other factors associated with grouse and grouse habitat would be the same as those described under the Proposed Action. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

No sage-grouse leks are present in the overlap area, but one lek site is located approximately 0.5 mile to the southeast, within the existing mine permit area (map 3.10-1). That lek site has not

been physically disturbed, but existing mine operations have been ongoing within 700 feet of the lek in recent years.

Under this alternative, two occupied sharp-tailed grouse leks would be affected by activities in the overlap area related to mining existing leases. One sharp-tailed grouse lek is located in the overlap area itself (map 3.10-1) and another lek is approximately 500 feet north of that area. A third sharp-tailed grouse lek is within the Buckskin Mine permit area, approximately 0.75 mile southeast of the overlap area and 1,200 feet and in view of ongoing mine operations. As described under the Proposed Action, the overlap area does not provide any unique habitat for these four upland game bird species. The area is dominated by upland grasslands, with sagebrush occurring in small patches scattered across approximately 86 noncontiguous acres.

No grouse nests or broods for either species have been documented in the overlap between the general analysis area and permit boundary, nor have grouse been observed in that area during winter. Both lek sites outside the overlap area but within the existing permit area have been or would be affected by previously permitted mine activities on existing leases.

The tree windbreak in the overlap area represents potential nesting and/or roosting habitat for mourning doves and sharp-tailed grouse. As described previously, these trees would be affected by mine disturbance under any of the alternatives considered in this EIS. Little sagebrush is present in the overlap area. Therefore, the establishment of reclaimed grassland communities after mining has been completed would not result in a dramatic change in habitat types from the premining landscape.

Alternative 2

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) and mine-related activities in the support area (926 acres) would have no impact on sage-grouse leks, but would have a moderate, long-term effect on two sharp-tailed grouse leks (map 3.10-1), and a minor, long-term impact on approximately 302 non-contiguous acres of potential sage-grouse nesting habitat (sagebrush). Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases would have no impact on sage-grouse leks or sagebrush. Impacts from mine-related noise on leks beyond the general analysis area would be minor and short-term due to the presence of natural buffers between mine activities and lek sites, and the temporary and incremental presence of operations in any given location. Impacts on known and potential upland game bird habitats from current facilities and mining techniques would be the same as those described above under the Proposed Action.

No sage-grouse leks occur within the general analysis area (map 3.10-1). The nearest sage-grouse lek (Hay Creek) is within the existing permit area approximately 0.5 mile to the southeast and, thus, is already subject to disturbance from previously permitted activities. The McGee sage-grouse lek is on private surface approximately 1.25 miles north of the general analysis area. That site is on the far side of multiple ridges that provide a visual and audio buffer, and it is not likely to be affected by mine operations. Sage-grouse were last observed at the Hay Creek lek in 2001 and the McGee lek in 2004; both are considered occupied by the WGFD.

Two occupied sharp-tailed grouse leks have been documented in the general analysis area over the last 26 years of annual monitoring (map 3.10-1). As described under the No Action Alternative, the McGee II lek is in the overlap area and the McGee III lek is immediately north of the overlap area. Due to their locations, those leks have been or would be disturbed by previously permitted mining of existing leases. The McGee I sharp-tailed grouse lek is approximately 0.25 mile north of the general analysis area. It would not be in view of that area due to the ridgeline that separates the two sites, but it could be affected by noise from within the general analysis area. The Stickel lek is approximately 0.75 mile southeast of the general analysis area and within the existing permit area; this site is within 1,200 feet and in view of previously permitted activities on existing leases. Sharp-tailed grouse were last recorded at the McGee II lek in 2004 and the McGee III lek in 2005. The McGee I lek was last active in 2001, and the Stickel lek in 2002.

Disturbance and reclamation activities would be temporary and occur incrementally throughout the general analysis area. If mining activities disturb an occupied lek, grouse would have to use an alternate site or establish a new lek for breeding activities.

In addition to lek sites, areas of suitable habitat for nesting are needed to sustain sage-grouse populations. One recent study suggests that availability of winter habitat may also affect sage-grouse populations (Naugle et al. 2006). The general analysis area is dominated (71% of total cover) by upland grasslands and agricultural fields, which do not provide the necessary shrub communities for forage and cover. Sagebrush in that area is limited to 302 noncontiguous acres, with an average patch size of approximately 4.9 acres. No grouse nests or broods have been documented in the general analysis area, nor have grouse been observed there during winter. Additionally, the general analysis area is not included in or within several miles of either a state sage-grouse core area or BLM sage-grouse focus area, though that does not preclude the need for grouse management when they are present.

The general analysis area does not provide any unique habitat for these four upland game bird species, and future mine operations would affect existing and potential habitat to varying degrees. As described previously, the prevalence of upland grasslands and agricultural lands, and the limited presence of surface water reduce the area's value to sagebrush obligates such as the sage-grouse. The only group of trees (potential habitat for doves and roosting sharp-tailed grouse) in the area that is not adjacent to an occupied or recently vacated residence also overlaps the existing permit area and, thus, would be affected by previously permitted activities regardless of the leasing decision. The upland grasslands and agricultural fields that dominate the area are well suited for gray partridge, an introduced species to this country, but no partridge have been documented in the general analysis area.

Leasing, mining, and reclaiming a tract within the general analysis area would result in permanent, alterations in the topography and long-term changes in vegetative composition from premine conditions. Because the general analysis area is dominated (71%) by upland grassland communities and agricultural lands, the establishment of reclaimed grassland communities after mining has been completed would represent similar or somewhat improved habitats,

respectively, compared to those in the premining landscape. Restoration of sagebrush communities that are present could be difficult to accomplish through artificial plantings, and can take decades through natural regeneration. Until sagebrush returns to its premining density, a reduction in potential habitat for wildlife species associated with that habitat would occur in the general analysis area.

Some evidence has been documented that sage-grouse do repopulate areas after reclaimed shrublands have become established, but that process may take decades (Braun 1998). Estimates for the time it would take to restore shrubs, including sagebrush, to premine density levels range from 20 to 100 years, which may delay sage-grouse repopulation in the reclaimed areas. Once they do return to an area, sage-grouse populations do not appear to attain their previous levels.

3.10.7. Other Birds

3.10.7.1. *Affected Environment*

The USFWS uses a list entitled the *Coal Mine List of 40 Migratory Bird Species of Management Concern in Wyoming* (table 3.10-3) for reviews related to existing and proposed surface coal mining (USFWS 2002). This list was taken directly from the Wyoming Bird Conservation Plan (Cerovski et al. 2001), and was current through 2009. The USFWS considers Level I species as in need of conservation action, which includes having a monitoring and mitigation plan for those birds. Continued monitoring is recommended, but not required, for Level II species.

Table 3.10-3. Forty Migratory Bird Species of Management Concern for Wyoming Coal Mines: Historical Occurrence and Status in or within 0.5 Mile of the Buckskin Mine Permit Area[a] (2007–2009)

Species[b]	Historical Occurrence in the Vicinity of the Buckskin Mine[c]	2007	2008	2009
LEVEL I				
Mountain plover[d] *Charadrius montanus*	never recorded	—	—	—
Greater sage-grouse[d] *Centrocercus urophasianus*	occasional breeder	—	—	—
McCown's longspur[d] *Calcarius mccownii*	rarely observed	observed	—	—
Baird's sparrow *Ammodramus bairdii*	never recorded	—	—	—
Ferruginous hawk[d] *Buteo regalis*	historic breeder	—	observed	—
Brewer's sparrow[d] *Spizella breweri*	regular breeder (beyond general analysis area)	presumed breeder	presumed breeder	presumed breeder
Sage sparrow *Amphispiza belli*	never recorded	—	—	—

Table 3.10-3. Continued

Species[b]	Historical Occurrence in the Vicinity of the Buckskin Mine[c]	2007	2008	2009
Swainson's hawk[d] *Buteo swainsoni*	rare breeder	potential breeder	—	—
Long-billed curlew *Numenius americanus*	infrequent spring migrant	—	—	observed
Short-eared owl[d] *Asio flammeus*	infrequently observed	—	observed	—
Peregrine falcon *Falco peregrinus*	never recorded	—	—	—
Burrowing owl[d] *Athene cunicularia*	rare breeder	—	—	—
Bald eagle *Haliaeetus leucocephalus*	occasional in winter	limited winter resident	limited winter resident	limited winter resident
Upland sandpiper[d] *Bartramia longicauda*	infrequently observed	—	—	—
LEVEL II				
Cassin's kingbird *Tyrannus vociferans*	never recorded	—	—	—
Lark bunting[d] *Calamospiza melanocorys*	common breeder	presumed breeder	presumed breeder	presumed breeder
Dickcissel *Spiza americana*	never recorded	—	—	—
Chestnut-collared longspur[d] *Calcarius ornatus*	rarely recorded	—	—	—
Black-chinned hummingbird *Archilochus alexandri*	never recorded	—	—	—
Pygmy nuthatch *Sitta pygmaea*	never recorded	—	—	—
Marsh wren *Cistothorus palustris*	never recorded	—	—	—
Western bluebird *Sialia mexicana*	never recorded	—	—	—
Sage thrasher[d] *Oreoscoptes montanus*	rarely observed	observed once	—	—
Grasshopper sparrow[d] *Ammodramus savannarum*	occasional breeder	potential breeder	potential breeder	presumed breeder
Bobolink *Dolichonyx oryzivorus*	never recorded	—	—	—
Common loon *Gavia immer*	never recorded	—	—	—
Black-billed cuckoo *Coccyzus erythropthalmus*	never recorded	—	—	—
Red-headed woodpecker *Melanerpes erthrocephalus*	never recorded	—	—	—

Table 3.10-3. Continued

Species[b]	Historical Occurrence in the Vicinity of the Buckskin Mine[c]	2007	2008	2009
Yellow-billed cuckoo *Coccyzus americanus*	never recorded	—	—	—
Eastern screech-owl *Megascops asio*	never recorded	—	—	—
Western screech-owl *Megascops kennicottii*	never recorded	—	—	—
Western scrub-jay *Aphelocoma coerulescens*	never recorded	—	—	—
Loggerhead shrike[d] *Lanius ludovicianus*	occasional breeder	potential breeder	—	potential breeder
Vesper sparrow[d] *Pooecetes gramineus*	common breeder	presumed breeder	presumed breeder	presumed breeder
Lark sparrow[d] *Chondestes grammacus*	occasional breeder	potential breeder	—	—
Ash-throated flycatcher *Myiarchus cinerascens*	never recorded	—	—	—
Bushtit *Psaltriparus minimus*	never recorded	—	—	—
Merlin[d] *Falco columbarius*	rarely observed	—	—	—
Sprague's pipit *Anthus spragueii*	never recorded	—	—	—
Barn owl *Tyto alba*	never recorded	—	—	—

[a] The survey area for the Buckskin Mine overlapped the entire proposed tract and much of the general analysis area in most years (from 1984-2009). Both areas were completely covered during baseline studies conducted from 2007 through 2009.

[b] Species are arranged in descending priority within each level as assigned in the Wyoming Bird Conservation Plan (Cerovski et al. 2001). Level I indicates a clear need for conservation action. Level II represents a need for continued monitoring.

[c] Historical occurrence in the Buckskin Mine survey area is based on records from baseline or monitoring studies conducted at the mine (1984–2009).

[d] Species regularly nests in the Powder River Basin.

The Buckskin Mine has conducted specific surveys for migratory birds of concern annually since at least 1993, incorporating new lists and survey protocols (breeding bird point counts) as they were issued. These surveys have been conducted in both spring and summer to detect both migrating and breeding birds. Beginning in 2006, annual point count surveys for breeding bird (primarily passerines) were conducted per a request by the USFWS Ecological Services Office in Cheyenne, Wyoming. Survey efforts used a fixed-radius circular plot method adapted from Reynolds et al. (1980). Results from these surveys are included in the annual report for the Buckskin Mine each year. Although breeding bird surveys are not required by Appendix B of the WDEQ Coal Rules and Regulations, they have been incorporated into the USFWS-approved Avian Monitoring and Mitigation Plan for the Buckskin Mine.

As described in section 3.10.2, the annual monitoring survey area for most migratory bird species of concern includes the existing permit area and a 0.5-mile radius. Because they are protected under one or more federal laws, the survey area for bald eagles and other raptor species is expanded to a 1-mile radius. The annual monitoring survey area for sage-grouse is also a 1-mile radius, but leks within 3 miles of the general analysis area were considered for this EIS to meet BLM concerns about this species.

Due to the proximity of the general analysis area to the existing Buckskin Mine permit area, the entire tract has been included in annual surveys for avian species of concern since at least 1993, with extensive coverage in the general analysis area during that period. Results from surveys conducted for migratory birds at the Buckskin Mine are available in baseline and annual wildlife reports, on file with the WDEQ in Sheridan, Wyoming. Those reports include a tabulation of the regional status, expected occurrence, historical observations, and breeding records for each species on the current list of avian species of concern for a given report year, as well as two or more preceding years; additional information for each species observed in a given year is also included in each report.

Table 3.10-3 provides a tabulation of the regional status and expected occurrence, historical observations, and breeding records for each of the species on the "Coal Mine List of 40 Migratory Bird Species of Management Concern in Wyoming," based on a compilation of the results of the annual surveys conducted for the Buckskin Mine from 2007 through 2009. Eighteen of the 40 listed species have historically been observed in the annual migratory bird survey area, though they may not have been seen in the EIS general analysis area: 10 Level I species and 8 Level II species. None of the Level I species regularly breed in the general analysis area, though they are often recorded elsewhere in the survey area. Twenty-two of the 40 avian species of concern have never been recorded in the general analysis area or Buckskin Mine permit area: 4 Level I and 18 Level II species. Some raptor species of management concern, including species that nest in the general analysis area, are discussed in section 3.10.5. Sage-grouse are discussed in section 3.10.6.

The most frequently recorded nesting species in the migratory bird survey area are the lark bunting (*Calamospiza melanocorys*), vesper sparrow (*Pooecetes gramineus*), and grasshopper sparrow (*Ammodramus savannarum*). All three of those species are considered Level II. The Brewer's sparrow (*Spizella breweri*), a Level I species, often nests in sagebrush stands in unmined portions of the existing permit area, beyond the general analysis area. Five additional species have nested (including failed attempts) less often in the area, including the Swainson's hawk, sage-grouse, short-eared owl, loggerhead shrike (*Lanius ludovicianus*), and lark sparrow (*Chondestes grammacus*); the grouse and both raptor species are considered Level I. The bald eagle is only observed in the winter or as a migrant. The other eight species have been observed infrequently (table 3.10-3).

The mountain plover is included on the "Coal Mine List of 40 Migratory Bird Species of Management Concern in Wyoming." The USFWS proposed listing the mountain plover as a threatened species in February 1999 but withdrew the proposal in September 2003

(USFWS 2008), based on the conclusion that information available at that time did not indicate the threats to the mountain plover and its habitat were likely to endanger the species in the foreseeable future. In June 2010, the USFWS reinstated the 2002 proposed rule to list the mountain plover as a threatened species and invited public comments. On May 11, 2011, after a thorough review of all available scientific and commercial information, the USFWS determined that the mountain plover is not threatened or endangered throughout all or a significant portion of its range, including the general analysis area and the rest of Campbell County, Wyoming (76 FR 92). Consequently, this species was removed from the listing process under the ESA. The USFWS continues to encourage provisions that would provide protection for this species, as it continues to be protected under the Migratory Bird Treaty Act and as a sensitive species under BLM policy (Bureau Manual 6840.06 E. Sensitive Species). This species has not been documented in within the migratory bird survey area; nor was it documented during other wildlife surveys conducted for the Buckskin Mine. Nevertheless, the current permit document for the mine includes species-specific protection measures for mountain plovers, in the event that they are present in the future.

Bald eagles are relatively common winter residents and migrants in northeastern Wyoming's PRB. No bald eagle winter roosts have ever been documented in the bald eagle survey area, though potential winter roosting habitat for this species is present. That habitat consists of isolated cottonwood shelterbelts in the general analysis area, as described in section 3.9. No known bald eagle nests, or consistent yearly concentrated prey or carrion sources (e.g., sheep, fisheries) for bald eagles have been documented in the bald eagle survey area.

The bald eagle was more common and abundant in the area during winters from 2004 through 2007 than in previous or subsequent years. This may have been a result of mild winters and the abundance of lagomorphs (rabbits) to prey upon. Bald eagles also scavenged road-killed rabbits off of adjacent roads. Rabbit numbers appeared to be at or near a peak in their cycle during those years. During those winters, one or two bald eagles occasionally used the shelterbelt is in the overlap area between the general analysis area and existing Buckskin Mine permit area. Bald eagles had never been observed concentrating in this windbreak during the previous two decades of wildlife surveys. No bald eagles have ever been documented in the tree shelterbelt around the recently vacated residence near the junction of the Collins and McGee roads in the general analysis area, or the shelterbelt surrounding the occupied residence between the two roads. A single adult bald eagle was observed once perched in an isolated cottonwood just south of the latter residence. As noted, bald eagle sightings within the Buckskin Mine survey area averaged only 0.5 per year over the last 26 years (1984–2009).

The burrowing owl is uncommon at the Buckskin Mine and has never been observed in the general analysis area. This species is an infrequent breeder in the prairie dog colony just beyond the northeastern corner of the general analysis area.

The sage-grouse was recently added to the Level I list of avian species of concern at coal mines. This species is becoming less common in the vicinity of the Buckskin Mine, as described in section 3.10.6. No sage-grouse leks are present in the general analysis area, and sage-grouse

have not been recorded there during the last 26 years of annual monitoring. Both the proposed tract and the general analysis area are dominated by upland grassland habitats, with only 11% (46 and 302 noncontiguous acres, respectively) of their areas comprised of sagebrush habitats. Suitable nesting habitat is scarce if not absent in the general analysis area for the remainder of the "Coal Mine List of 40 Migratory Bird Species of Management Concern in Wyoming"; therefore, the other species have rarely or never been recorded.

Under natural conditions, limited seasonal waterfowl and shorebird habitat is present in the general analysis area. Prior to CBNG development, the natural aquatic habitat in the general analysis area was mainly available during spring migration as a single ephemeral stream, two stock impoundments, and a closed-basin playa. All of these water features generally were quite low or dry after spring. The relatively recent development of CBNG resources upstream and within the general analysis area has enhanced surface water availability to some degree resulting in a limited increase in habitat for waterfowl and shorebird species. However, all water bodies within the general analysis area continue to be dry or nearly so by mid-summer in most years; exceptions occur during years with above average precipitation.

The adjacent Buckskin Mine has conducted a voluntary program of waterfowl and shorebird monitoring at various native and reclaimed water bodies in the existing permit area. Multiple surveys were conducted in spring and summer each year since 2004. Those surveys did not include the playa located between the Collins and McGee roads, the largest and most persistent water body in the general analysis area, but it did include a similar playa in the mine permit area, approximately 1.25 miles south of the general analysis area. Both playas have been enhanced by CBNG discharge water in recent years. Common species seen at the playa within the permit area include the Canada goose (*Branta Canadensis*), American wigeon (*Anas Americana*), blue-winged teal (*Anas discors*), mallard (*Anas platyrhynchos*), northern pintail (*Anas acuta*), northern shoveler (*Anas clypeata*), gadwall (*Anas strepera*), and green-winged teal (*Anas crecca*), along with common shorebirds such as the killdeer (*Charadrius vociferus*) and spotted sandpiper (*Actitis macularia*). Similar species have been or would be expected to be recorded at the playa in the general analysis area.

3.10.7.2. Environmental Consequences

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mine-related activities in the support area (241 acres) would have a minor, short-term impact on nesting, roosting, and foraging habitat for migratory bird species of management concern, as well as carrying capacity and habitat diversity on reclaimed lands. This alternative would have a negligible, short-term impact on waterfowl. Activities in the remainder of the overlap area (474 acres) related to mining existing coal leases would have the same impacts on migratory birds and waterfowl as in the proposed tract and support area. None of the 18 migratory bird species of management concern for Wyoming coal mines that have historically been observed in the migratory bird survey area are regularly seen in the proposed tract. The upland grasslands

that dominate the tract lack the specific characteristics (shrubs, wetlands, prairie dog colonies, or shorter, less dense grasses) typically associated with most Level I species that have historically been recorded in the area. No sage-grouse leks are present in the proposed tract. The bald eagle is the only avian species of concern that has been recorded in the proposed tract. This species has been documented an average of less than once per year in the vicinity of the Buckskin Mine over the last 26 years of annual monitoring, with even fewer observations in the tree shelterbelt in the overlap area in section 19, T52N R72W. That shelterbelt is already subject to mine related disturbance associated with existing coal leases. Additional potential impacts on the sage-grouse and raptors in general, as well as measures in place to prevent impacts on these species from existing mining operations, were included in the preceding discussions. Additional information regarding species currently or recently involved in the ESA listing process is provided in appendix J.

The Proposed Action could have impacts on existing nesting and foraging habitat for these species in the proposed tract and support area. The habitat loss would be short-term for grassland species, but would last longer for shrub-dependent species. However, with less than 11% of the total composition, sagebrush is not a dominant community in those areas. Reclamation practices at the Buckskin Mine are designed to provide a mosaic of upland and bottomland habitats that would potentially host most of these species. All disturbance and reclamation efforts would occur incrementally throughout the area. Because the proposed tract is dominated (71%) by upland grassland communities, the establishment of reclaimed grasslands after mining has been completed would not result in a dramatic change in habitat types from the premining landscape. Periodic breeding bird surveys at other surface mines with similar habitats in the region since the mid 1980s have demonstrated that species richness and abundance in reclaimed habitats are equal to or greater than in their native counterparts, though species composition may not be the same due to differences between premining and postmining vegetation. Additionally, surface coal mines in the PRB of northeastern Wyoming are required to replace each tree lost to mining, though it will take many years for newly planted trees to reach maturity. Research projects on habitat reclamation on mined lands within the PRB for small mammals and birds concluded that the diversity of song birds on reclaimed areas was less than on adjacent undisturbed areas, although their overall numbers were greater (Shelley 1992; Clayton et al. 2006).

No impacts on mountain plovers are anticipated because this species has never been documented in its survey area in the last 26 years of monitoring. Additionally, typical suitable habitat (short and sparse vegetation) for this species is not present in the general analysis area.

The Proposed Action would have a negligible, short-term effect on migrating and breeding waterfowl and shorebirds due to the extremely limited presence and seasonal nature of open water and wetland habitats in the area. Sedimentation ponds created during mining would provide interim habitat for aquatic fauna. The current reclamation plan for the Buckskin Mine requires that the segment of the Hay Creek channel in the northern portion of the general analysis area affected by currently permitted mining be reclaimed to restore its premining functions and aquatic habitats. The diversion channel and other future diversions would not provide the same

habitat as the natural channels, although natural stream flow and the presence of CBNG discharge water would not be affected. Mitigation for all impacts on jurisdictional wetlands would be required in accordance with section 404 of the Clean Water Act (section 3.7). If new wetlands do not duplicate the exact function and/or landscape features of the premine wetlands, species associated with those habitats could be beneficially or adversely affected as a result, depending on their premine status.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have the same impacts on migratory birds and waterfowl as those described under the Proposed Action. No unique habitat features occur in the overlap area. The only trees or primary water body are the tree shelterbelt in section 19, T52N R72W and Hay Creek, respectively; the tree stand is expected to be disturbed and the creek has already been diverted during previously permitted activities. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) and mine-related activities in the support area (926 acres) would have a moderate, short-term impact on nesting, roosting, and foraging habitat for migratory bird species of management concern, as well as carrying capacity and habitat diversity on reclaimed lands. This alternative would have a negligible, short-term impact on waterfowl. Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases would have the same impacts on migratory birds and waterfowl as in the proposed tract.

None of the 18 migratory bird species of management concern for Wyoming coal mines that have historically been observed in the vicinity are regularly seen in the general analysis area. The upland grasslands and agricultural lands that dominate the area lack the specific characteristics (shrubs, wetlands, prairie dog colonies, or shorter, less dense grasses) typically associated with most Level I species that have historically been recorded in the area. No sage-grouse leks are present in the general analysis area; the lone sage-grouse lek in the immediate vicinity is located in the existing permit area and, thus, is already subject to previously permitted disturbances. An average of less than one bald eagle per year has been recorded in the entire Buckskin Mine survey area that overlaps the general analysis area. The tree shelter belt in section 19, T52N R72W where bald eagles have occasionally been observed is in the overlap area, which is already scheduled for eventual disturbance associated with previously permitted activities for existing coal leases. Additional potential impacts on the sage-grouse, bald eagle, and raptors in general, as well as measures in place to prevent impacts on these species from existing mining operations, were included in the preceding discussions.

Impacts on existing habitats for these species would be short-term for grassland species, but would last longer for shrub-dependent species. However, with less than 11% of the total

composition, sagebrush is not a dominant species in the general analysis area. Reclamation practices at Buckskin are designed to provide a mosaic of upland and bottomland habitats that would potentially host most of these species. All disturbance and reclamation activities would occur incrementally throughout the area. Because the proposed tract is dominated (71%) by upland grassland and agricultural lands, the establishment of reclaimed grasslands after mining has been completed would not result in a dramatic change in habitat types from the premining landscape. Periodic breeding bird surveys at other surface mines with similar habitats in the region since the mid 1980s have demonstrated that species richness and abundance in reclaimed habitats are equal to or greater than in their native counterparts, though species composition may not be the same due to differences between premining and postmining vegetation. Additionally, surface coal mines in the PRB of northeastern Wyoming are required to replace each tree lost to mining, though it will take many years for newly planted trees to reach maturity. Research projects on habitat reclamation on mined lands within the PRB for small mammals and birds concluded that the diversity of song birds on reclaimed areas was less than on adjacent undisturbed areas, although their overall numbers were greater (Shelley 1992; Clayton et al. 2006).

No impacts on mountain plovers are anticipated because this species has never been documented in its survey area in the last 26 years of monitoring. Additionally, typical suitable habitat (prairie dog colonies and other areas of short, sparse vegetation) for this species is not present in the general analysis area.

Alternative 2 would have a negligible effect on migrating and breeding waterfowl and shorebirds due to the extremely limited presence and seasonal nature of this habitat in the area. Sedimentation ponds created during mining would provide interim habitat for aquatic fauna. The current reclamation plan for the Buckskin Mine requires that the segment of the Hay Creek channel in the northern portion of the general analysis area affected by currently permitted mining be reclaimed to restore its premining functions and aquatic habitats. The diversion channel and other future diversions would not provide the same habitat as the natural channels, although natural streamflow and the presence of CBNG discharge water would not be affected. Mitigation for all impacts on jurisdictional wetlands would be required in accordance with section 404 of the Clean Water Act (section 3.7). If the mitigated wetlands do not duplicate the exact function and/or landscape features of the premine wetlands, species associated with those habitats could be beneficially or adversely affected as a result, depending on their premine status.

Only three shelterbelts are present in the general analysis area. One stand is in the overlap with the existing Buckskin Mine permit area and the other two surround currently or recently occupied residences.

3.10.8. Amphibians, Reptiles, and Aquatic Species

3.10.8.1. *Affected Environment*

Wildlife surveys completed specifically for the Buckskin Mine and adjacent mines, as well as biological research projects in the eastern PRB, have documented numerous other wildlife species that inhabit the region, including various amphibians, reptiles, and aquatic species. Some of these species are common inhabitants of the wildlife survey area for the Buckskin Mine, but they have not necessarily been regularly observed in the general analysis area.

Reptile and amphibian species have been recorded during the various surveys at the Buckskin Mine and on adjacent lands, including the general analysis area. These species include the tiger salamander (*Ambystoma tigrinum*), great plains toad (*Bufo cognatus*), boreal chorus frog (*Pseudacris triseriata maculata*), eastern short-horned lizard (*Phrynosoma douglassi brevirostre*), prairie rattlesnake (*Crotalus viridis viridis*), and bullsnake (*Pituophis melanoleucas sayi*). The abundance of these reptiles and amphibians is difficult to determine but these species appear to be common to the area.

Under natural conditions, aquatic habitat is limited by the temporary nature of most surface waters in the general analysis area. The lack of deep-water habitat and extensive and persistent water sources within that region precludes the presence and diversity of fish and other aquatic species. Consequently, monitoring of aquatic species is not regularly conducted at the Buckskin Mine, and fish surveys were not required or conducted specifically for the proposed tract.

The scarcity of mesic habitats throughout the majority of the wildlife survey area for the Buckskin Mine also reduces the potential of the area to attract aquatic species. Recent influxes of CBNG discharge water into Hay Creek has provided extended periods of surface water in some, but not all, of the last few years.

3.10.8.2. *Environmental Consequences*

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mine-related activities in the support area (241 acres) would have a negligible, short-term impact on aquatic species. Activities in the remainder of the overlap area (474 acres) related to mining existing coal leases would have the same impact as in the proposed tract and support area.

Mining the proposed tract would remove habitat for amphibians and reptiles in some areas. Disturbance and reclamation activities would occur incrementally throughout the area. Due to the limited presence of water in the area, no fisheries and few, if any, other aquatic species would be affected. Because the proposed tract is dominated (71%) by upland grassland communities, the establishment of reclaimed grasslands after mining would not result in a dramatic change in habitat types from the premining landscape.

Under jurisdiction of the Buckskin Mine's current WDEQ mine permit, Hay Creek has already been diverted to recover coal from the existing coal leases (section 3.5.2.1). This diversion does not impact the proposed tract. The aquatic resources of Hay Creek would be restored after mining to approximate premining conditions.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have the same impact as described under the Proposed Action. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Water resources in the overlap area are not sufficient to support fisheries and few, if any, other aquatic species would be affected. Under jurisdiction of the Buckskin Mine's current WDEQ mine permit, Hay Creek has already been diverted to recover coal from the existing coal leases (section 3.5.2.1). This diversion affects the northern part of the overlap between the general analysis area and existing permit area. The aquatic resources of Hay Creek would be restored after mining to approximate premining conditions.

Alternative 2

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) and mine-related activities in the support area (926 acres) would have a negligible, short-term impact on aquatic species. Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases would have the same impact as in the proposed tract and support area. Mining in the general analysis area would remove habitat for amphibians and reptiles in some areas. Disturbance and reclamation activities would occur incrementally throughout the area. Due to the limited presence of water in the area, no fisheries and few, if any, other aquatic species would be affected. Because the general analysis area is dominated (71% combined) by upland grassland communities and agricultural lands, the establishment of reclaimed grassland communities after mining has been completed would represent similar or somewhat improved habitats, respectively, compared to those in the premining landscape.

Under jurisdiction of the Buckskin Mine's current WDEQ mine permit, Hay Creek has already been diverted to recover coal from the existing coal leases (section 3.5.2.1). This diversion does not impact the proposed tract, but it does span the northern part of the general analysis area. The aquatic resources of Hay Creek would be restored after mining to approximate premining conditions.

3.10.9. Threatened, Endangered, Proposed, and Candidate Animal Species, and BLM Sensitive Species

The current list of federal endangered, threatened, and candidate species for Campbell County, Wyoming, includes one vertebrate species. As of March 2010, the greater sage-grouse was classified as a candidate species based on the recent listing decision of "warranted, but

precluded" under the ESA (USFWS 2010). The species list is available at the USFWS website: http://www.fws.gov/wyominges/PDFs/CountySpeciesLists/Campbell-sp.pdf.

Appendix J of this document contains the biological assessment for federally listed species and appendix K contains a discussion of the BLM sensitive species evaluation. No threatened or endangered vertebrate species would be affected under any alternative analyzed in this EIS. In February 2004, the USFWS issued a block clearance for black-footed ferrets (*Mustela nigripes*) in black-tailed prairie dog colonies throughout Wyoming (USFWS 2004). As of March 2010, the ferret was no longer included on the list of threatened and endangered species for Campbell County (USFWS 2010).

3.10.10. Regulatory Compliance, Mitigation and Monitoring

The current USFWS-approved monitoring and mitigation plan for Migratory Bird Species of Management Concern for Coal Mines in Wyoming must be updated prior to both the WDEQ permitting phase and the occurrence of new disturbance associated with new coal leases to include any new species, nests, or important habitats that could be affected under the action alternatives. The development and implementation of such mitigation plans has proven to be effective in providing mitigation options that minimize or preclude negative impacts on nesting raptors and other migratory bird species of concern. The current monitoring and mitigation plan and the associated USFWS approval letter are included in the existing Buckskin Mine permit document, on file with the WDEQ in Sheridan, Wyoming. The plan includes the following provisions:

- creating raptor nests and nesting habitat through enhancement efforts (nest platforms, tree plantings) to mitigate other nest sites affected by mining operations;
- relocating raptor nests that would be affected by mining in accordance with the approved raptor monitoring and mitigation plan;
- obtaining federal and/or state permits for removal and mitigation of golden eagle nests and those of other raptor species;
- restricting mine-related disturbances from encroaching within stipulated buffers of active raptor nests from egg-laying until fledging to prevent nest abandonment and injury to eggs or young;
- reestablishing ground cover necessary for the return of a suitable raptor prey base after mining; and
- requiring use of current raptor-safe construction for overhead power lines (APLIC 2006).

In addition to a USFWS-approved avian monitoring and mitigation plan, regulatory guidelines and requirements designed to prevent or reduce surface coal mining impacts on wildlife include:

- fencing designed to permit passage of pronghorn and other big game species to the extent possible;

- restoring sage-grouse habitat after mining including reestablishing sagebrush and other shrubs on reclaimed lands and grading reclaimed lands to create swales and depressions suitable for sagebrush obligates and their young;
- restoring diverse landforms, replacing topsoil, and constructing brush piles, snags, and rock piles to enhance habitat for wildlife;
- restoring short-grass habitat for species that nest and forage in those habitat types;
- restoring habitat provided by jurisdictional wetlands;
- reclaiming the stream channels and restoring surface water flow quantity and quality after mining to approximate premining conditions;
- and the implementation of species-specific protective measures for listed species, as needed.

The current permit for the Buckskin Mine requires reconstruction of bed form features in major stream channels, such as pools and runs, that should help restore the channels' natural function, as well as provide habitat. Restoration will be or may be achieved by salvaging sufficient material from channel terrace alluvium or material having the same physical characteristics to reconstruct pool features. Current reclamation, as well as future reclamation of Hay Creek would incorporate any alluvium salvaged from the original channel. These measures are included in the existing mining and reclamation permit and would be included in the amended mining and reclamation plans, if either of the action alternatives is implemented.

Baseline wildlife surveys were conducted for the adjacent Buckskin Mine before mining operations began. Annual wildlife monitoring surveys have been conducted since the mid 1980s. These surveys are required by state and federal regulations, and will continue for the life of the mine; the annual survey area would be expanded to accommodate new coal leases, as needed. The mine has also voluntarily conducted annual and/or periodic surveys for additional species that are not included in the monitoring required by state or federal regulations. The wildlife monitoring surveys cover the areas included in the mine permit areas and a surrounding perimeter that varies in size according to the species being surveyed. As a result, the entire proposed tract and most of the surrounding general analysis area have been surveyed as part of the required monitoring surveys for the Buckskin Mine for many years.

The current annual monitoring program at the Buckskin Mine includes:

- spring surveys for new and/or occupied raptor nests, upland game bird lek locations, threatened and endangered species, and migratory birds;
- late spring surveys of raptor production for occupied nests, opportunistic observations of all wildlife species, threatened and endangered species, and migratory birds;
- raptor territorial occupancy and nest productivity surveyed within a 1-mile (annual monitoring) or 2-mile (baseline inventories) radius of the existing permit areas;
- summer surveys for raptors, migratory birds, and lagomorph density;
- breeding bird surveys;

- winter surveys for bald eagle winter roosts in and within 1 mile of the permit area (conducted as needed based on proximity of disturbance to potential roosting habitat);
- voluntary winter surveys for big game in and surrounding the permit area (currently conducted during alternate years); and
- voluntary annual surveys for migrating and nesting waterfowl, shorebirds, and other water obligate avian species.

Similar annual monitoring programs have been in effect at most other PRB coal mines since the mid-1990s.

Monitoring data were collected by all of the surface coal mines in the PRB for big game species from at least 1995 until 1999, with most mines conducting annual surveys since the mid to late 1980s until the early 2000s. In 1999, the WGFD reviewed monitoring data and requirements for big game species on those mine sites. They concluded that monitoring had demonstrated a lack of impacts on big game on existing mine sites. No severe mine-caused mortalities had occurred, and no long-lasting impacts on big game had been noted on existing mine sites. The WGFD recommended at that time that big game monitoring be discontinued on all existing mine sites. New mines will be required to conduct big game monitoring if located in crucial winter range or in important migration corridors, neither of which are present within the proposed tract or general analysis area. Although big game surveys are no longer required as part of the annual wildlife monitoring program at the Buckskin Mine, Kiewit has voluntarily continued these surveys on a reduced but regular schedule.

The Buckskin Mine currently operates under a raptor monitoring and mitigation plan approved by the USFWS. This plan would be amended to include the final tract configuration if additional federal coal reserves are leased and proposed for mining. The amended raptor mitigation plan would be subject to review and approval by USFWS before the amended mining plan is approved.

A monitoring and mitigation plan for migratory bird species of management concern has also been developed in cooperation with USFWS for the existing Buckskin mining operation, and that plan would be amended to include the final tract configuration. If additional species are documented nesting or using the area regularly, a mitigation plan would be developed to protect those birds and their habitat.

3.10.11. Residual Impacts

Although the lands disturbed by future mining would be reclaimed in accordance with the requirements of SMCRA and Wyoming statutes, some residual wildlife impacts would occur. The reduction in topographic variety would result in a permanent loss of habitat diversity and a potential decrease in slope-dependent shrub communities. This would reduce the carrying capacity of the land for shrub-dependent species. Limited riparian and aquatic habitats are present in the general analysis area. Areas that currently support sagebrush would be altered to a grassland community, perhaps for decades, during the interim between sage plantings and

maturity in reclamation. Until premining habitats have been fully reestablished, such habitat transformations would likely result in a change in wildlife species composition. Those species may repopulate reclaimed areas, but populations may not attain premining levels. The limited presence of sagebrush communities in the general analysis area would help minimize such residual impacts. Minimal residual impacts on threatened and endangered, candidate, or proposed plant and animal species would occur, because few such species have ever been recorded in the general analysis area, and state and federal regulations require reclamation of specific habitats important for these species.

3.11. Land Use and Recreation

This section discusses the affected environment and environmental consequences in the general analysis area as they relate to surface and mineral ownership, and land use (private and industrial), including impacts resulting from the Proposed Action and alternatives. Those impacts are considered in and within 3 miles of the general analysis area for recreation resources.

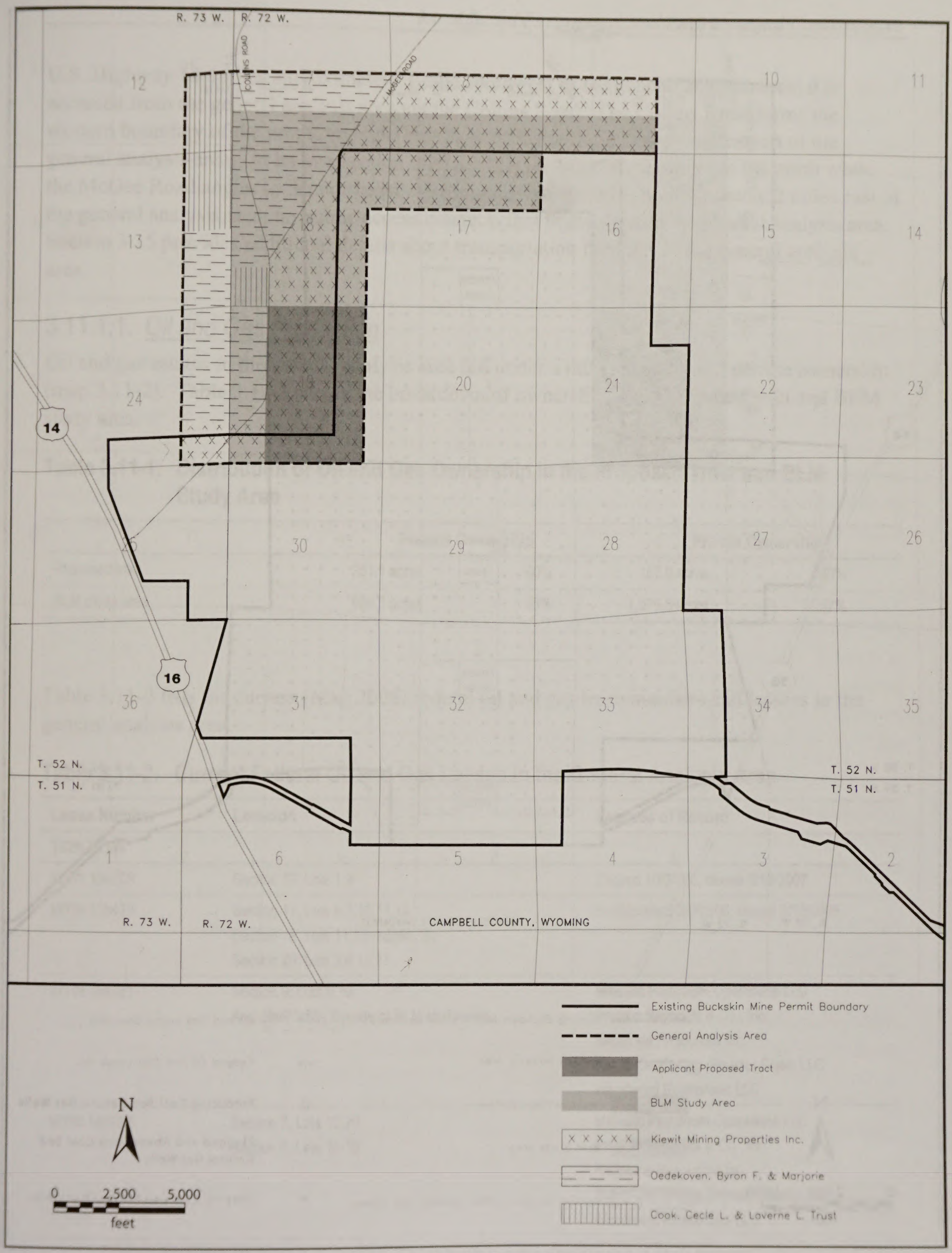
3.11.1. Affected Environment

Campbell County does not have a countywide land use plan, but has been working on a comprehensive land use plan jointly with the City of Gillette. The City of Gillette's land use plan, *City of Gillette/Campbell County Comprehensive Planning Program*, provides general goals and policies for land use in the county, including state and federal coal leases, and is an integral part of the overall plan for Campbell County (City of Gillette 1978). The proposed lease area does not have a designated zoning classification.

The entire surface of the existing Buckskin Mine permit area and general analysis area is privately owned by individuals or companies (map 3.11-1). All of the federal coal reserves in the proposed tract and BLM study area are federally owned, whereas the remaining subsurface minerals (i.e., oil and gas reserves) are under a mixture of private and federal ownership (map 3.11-2). All oil and gas production infrastructure located in the proposed tract is privately owned; facilities in the rest of the general analysis area are under a mix of federal and private ownership. Section 3.11.1.1 provides additional information about mineral ownership.

Wildlife habitat and livestock grazing are the primary present and historical land uses in the general analysis area. Secondary land uses include pastureland (ranching), dryland cropland, transportation, and CBNG development. Coal mining at the Buckskin Mine is and has been the dominant land use to the east and south of the general analysis area since the mid 1980s.

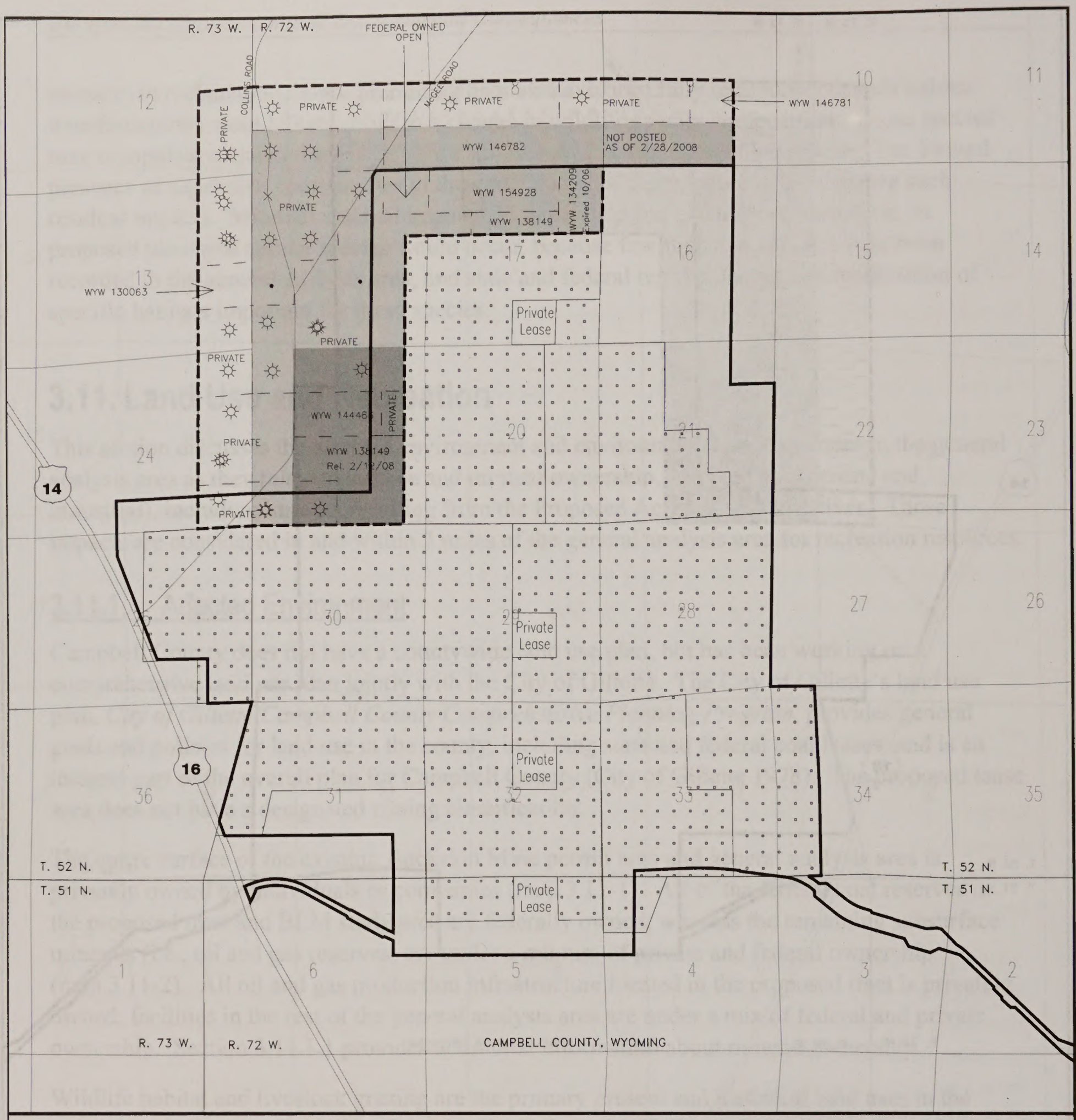
In addition to existing surface disturbance associated with the Buckskin Mine, the general analysis area includes small crop areas, two Campbell County roads (the Collins and McGee roads), several overhead electric transmission lines, oil and gas pipelines, and three residences. Only one of the three residences is currently occupied.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 3.11-1

Surface Ownership in the General Analysis Area



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 3.11-2

Oil and Gas Ownership, Leases, and Facilities in the General Analysis Area

U.S. Highway 14-16 lies approximately 1 mile southwest of the general analysis area; it is accessed from the general analysis area via the Collins Road. The Collins Road forms the western boundary of the proposed tract, crossing vertically through the western part of the general analysis area. At its intersection with the McGee Road, it continues to the north while the McGee Road angles to the northeast. Wyoming Highway 59 is approximately 2 miles east of the general analysis area; no public access connects that highway with the general analysis area. Section 3.15 provides additional details about transportation facilities in the general analysis area.

3.11.1.1. *Oil and Gas Production*

Oil and gas estates in the general analysis area fall under a mix of federal and private ownership (map 3.11-2). Table 3.11-1 shows the breakdown of ownership in the proposed tract and BLM study area.

Table 3.11-1. Distribution of Oil and Gas Ownership in the Proposed Tract and BLM Study Area

	Federal Ownership		Private Ownership	
Proposed tract	251.1 acres	60%	167.9 acres	40%
BLM study area	806.5 acres	43%	1,076.5 acres	57%

Table 3.11-2 lists the current (May 2008) federal oil and gas lease numbers and lessees in the general analysis area.

Table 3.11-2. Current Federal Oil and Gas Leases in the General Analysis Area

Lease Number	Location	Lessees of Record
T52N R72W		
WYW 134209	Section 17; Lots 1,9	Expired 10/31/06, closed 3/19/2007
WYW 138419	Section 17; Lots 6,7,10,11,14 Section 19; Lots 11,13–15, 19, 20 Section 20; Lots 3,6,10,11	Relinquished 2/6/2008, closed 2/12/2008
WYW 146781	Section 9; Lots 9,10 And other lands outside of BLM study area	Majestic Petroleum Operations LLC Preston Reynolds & Co., Inc. Redstone Resources Inc. Storm Cat Energy (Powder River) LLC Woodward Enterprises LLC
WYW 146782	Section 7; Lots 13,20 Section 8; Lots 10-16	Majestic Petroleum Operations LLC Preston Reynolds & Co., Inc. Redstone Resources Inc. Storm Cat Energy (Powder River) LLC Woodward Enterprises LLC

Table 3.11-2. Continued

Lease Number	Location	Lessees of Record
WYW 154928	Section 17; Lots 2–4	Van K. Bullock
WYW 144486	Section 19; Lot 10	Terminated 8/8/2008
T52N R73W		
WYW 130063	Section 2; Lots 7,10,12,18	Devon Energy Production Co. L.P. Majestic Petroleum Operations LLC Redstone Resources Inc. Woodward Enterprises LLC

According to WOGCC records (May 2008), no permitted, operating conventional oil wells are located in the general analysis area. The Supreme Court has ruled (98-830) that CBNG, previously referred to as coal bed methane or CBM, belongs to the owner of the oil and gas estate. As of May 2008, 30 permits had been issued for drilled or proposed well sites on lands in the BLM study area itself. Of those, 12 have expired without drilling, 3 are reported as plugged and abandoned, and 15 are currently producing. Another 12 wells are producing CBNG in the support area for the BLM study area. Additional information relative to conventional oil and gas and CBNG development in the general analysis area is included in section 3.3.2.

When surface rights are in private ownership and the rights to develop the mineral resources (e.g., underlying oil and gas estates) are publicly held and managed by the federal government, it is referred to as a split estate. In split estates, mineral rights are considered dominant, taking precedence over other rights associated with the property, including surface ownership. The mineral owner must show due regard for the interests of the surface owner and occupy only those portions of the surface that are reasonably necessary to develop the mineral estate (BLM 2009b).

Under FLPMA, the BLM is mandated to manage public lands under a multiple-use approach, including the federal mineral estate, to enhance the quality of life for all present and future generations. The Mineral Leasing Act of 1920 guides the land use planning, leasing, bonding, operations, and reclamation associated with all development of federal oil and natural gas resources. Various laws granted land patents to private individuals but reserved the mineral rights for the federal government. The BLM must comply with the provisions of the laws under which the surface was patented; however, many of those laws do not identify the rights of the surface owner in split estate mineral development situations (BLM 2009b).

Numerous ancillary facilities exist in support of current oil, gas, and CBNG development in the general analysis area. This supporting infrastructure may include well access roads; well pads; surface or underground production equipment at the wellheads; well production casing that extends from the surface to the production zone; underground gas-gathering lines and high-pressure transmission pipelines; facilities for the treatment, discharge, disposal, containment, or injection of produced water; metering and compressor stations; and electrical overhead or underground power lines to energize pumps and compressors. Because CBNG development and production have been occurring near the Buckskin Mine for many years, some of these facilities, particularly pipelines, lie within the general analysis area (section 3.15).

Section 3.3.2 and section 3.11.1 address producing, abandoned, and shut-in oil and gas (conventional and CBNG) wells in the general analysis area; appendix F (table of permitted oil/gas wells) discusses these features within 3 miles of the general analysis area. Well location information, oil and gas ownership and oil and gas lease information are presented on map 3.11-2 and in table 3.11-2. The BLM manages federal lands on a multiple-use basis, in accordance with federal regulations. In response to conflicts between oil and gas and coal lease holders, BLM policy advocates optimizing the recovery of all minerals to ensure that the public receives a reasonable return for these publicly owned resources. Optimal recovery of coal and oil and gas resources requires negotiation and cooperation between the oil and gas lessees and the coal lessees. In the past, negotiations between some applicant mines and existing oil and gas lessees have resulted in agreements that allowed development of both resources on portions of recently issued LBA tracts. In the PRB, royalties have been and would be lost to both the state and federal governments if federally owned CBNG is not recovered prior to mining, or if federal coal is not recovered due to conflicts between lessees. State and federal governments can lose bonus money when the costs of the agreements between the lessees are factored into the fair market value determinations.

3.11.1.2. *Coal Mining*

South and east of the general analysis area, coal mining is the dominant land use. The mines in this area—Buckskin, Rawhide, Eagle Butte, Dry Fork, and Wyodak—form a contiguous development area from the northernmost mine (Buckskin) to the Wyodak mine located just outside and immediately east of the City of Gillette. This cluster of mines represents the northernmost group of developed coal mines in Campbell County. The permitted coal production rate at the Buckskin Mine is currently 42 million tons; actual production in 2007 was 25.3 million tons, representing an increase of approximately 11% over the 22.8 million tons produced in 2006. The other four coal mines are permitted for a combined total annual production of 86 million tons, and reported a total actual production in 2007 of 52.4 million tons. The Hay Creek II lease application is the only LBA currently pending in this group of mines. Eagle Butte's West LBA (WYW-155132) was the last lease granted to a mine in the group.

3.11.1.3. *Recreation*

Big game hunting (pronghorn, mule deer, and white-tailed deer) is the principal recreational land use within approximately 3 miles of the general analysis area (recreation analysis area) (section 3.10). Surface land ownership in the PRB is approximately 80% private, and hunting is allowed only with the landowner's permission. The WGFD reports that limited hunter access to private lands has become a primary issue in providing hunting opportunities and controlling optimal harvest levels and distribution (WGFD 2008a). During the past two or three decades, landowners have been increasingly reluctant to allow sportsmen to freely cross and hunt on their lands, thus reducing the amount of private lands that are open and reasonably available for hunting. Access fees are commonly levied and continue to rise. Most of the private land in the recreation analysis area is leased to professional outfitters catering to nonresident hunters.

In general, USDA-FS- or BLM-managed public lands in Wyoming, as well as state-owned school sections, are open to hunting if legal access is available. Due to safety concerns, however, publicly owned surface lands contained in active mining areas are closed to the public. No public lands are included in the recreation analysis area. In addition to access, WGFD (2008) cites that drought, severe winters, and increased incidents of poaching have diminished the hunting opportunities for deer and pronghorn in the recreation analysis area during the past decade.

The WGFD classifies most of the recreation analysis area as yearlong habitat for pronghorn. None of the area is classified as severe winter range, crucial, or critical habitat, and no migration corridors have been identified. The recreation analysis area is in pronghorn hunt area 17, which is within the Gillette pronghorn herd unit. During the 2007 season, harvest from this herd unit (including all animals harvested in hunt areas 17, 18, and 19) included 958 bucks, 533 does, and 0 fawns (a total of 1,481 pronghorn). Post-season population estimated for the same pronghorn herd unit in 2007 numbered 16,823, which is well above the objective (11,000) for the herd (WGFD 2008a).

The WGFD has classified the lands in the recreation analysis area as a mix of yearlong and winter/yearlong range for mule deer. No winter, crucial, or critical mule deer habitat or migration corridors have been identified in this area. The recreation analysis area is located in mule deer hunt area 18, part of the Powder River mule deer herd unit, which also includes hunt areas 17, 23, and 26. During the 2007 season, harvest from this herd unit (in hunt area 18) included 657 bucks, 255 does, and 0 fawns (a total of 912 mule deer out of 1,553 active licenses issued). Total harvest for the Powder River mule deer herd unit included 2,590 bucks, 1,076 does, and 44 fawns (a total of 3,710). The 2007 post-season population estimate was 49,560 with a herd management objective of 52,000. The WGFD believes that, because outfitters lease much of the private land in this herd unit and hunting antlered bucks is encouraged, the buck/doe ratios are skewed, and additional pressure is placed on any accessible public lands.

The WGFD manages white-tailed deer separately from mule deer. This species is rarely seen in the recreation analysis area because white-tailed deer prefer riparian areas and irrigated agricultural lands (WGFD 2008a). The entire area is outside of any white-tailed hunting area authorized by WGFD; therefore, no licenses may be issued or filled.

Rare sightings of elk have been confirmed in the recreation analysis area. No elk hunt areas have been assigned in Campbell County. The closest is the Fortification area herd approximately 18 miles southwest of the general analysis area, and another in the Rochelle Hills near the Thunder Basin National Grasslands, approximately 70 miles southeast of the general analysis area.

Upland game birds (e.g., turkeys, grouse) inhabit some parts of the recreation analysis area. Hunting opportunities are limited because of lack of habitat and restricted access to private lands. The turkey hunting seasons are spring and fall, while other upland game birds are hunted only in fall.

No sport fisheries exist in the recreation analysis area.

3.11.2. Environmental Consequences

3.11.2.1. *Proposed Action*

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mine-related activities in the support area (241 acres) would have a moderate, short-term impact on livestock grazing opportunities during mining and CBNG facilities. This alternative would have a minor to moderate, short-term impact on access for sub-coal oil and gas development. The Proposed Action would have a negligible to moderate, short- to long-term impact on wildlife habitat, depending on the species, and no impact on removal of conventional oil and gas facilities and loss of access to public land in the proposed tract and support area. Activities in the remainder of the overlap area (474 acres) related to mining existing coal leases would have the same impacts as those in the proposed tract and support area.

All existing CBNG surface and downhole production and transportation equipment and facilities would be removed under this alternative, and all oil and gas development in these areas would be stopped during mining and reclamation activities. No surface facilities for conventional oil and gas would be affected. Oil and gas development could resume after reclamation is complete and the bond is released (approximately 10 years). Deeper conventional oil and gas could be reestablished, and coal seams deeper than those intended for mining would also be available for CBNG development in the postmine environment.

Existing coal and transportation activities, infrastructure, and facilities would continue to operate in the area. Coal production would be expected to remain at its current average rate of 25 million tons per year. No major public roadways would be affected; Kiewit does not anticipate relocating the Collins Road to access new federal coal reserves.

Livestock and wildlife would be incrementally displaced during mining as activities progress; all disturbance areas would be reclaimed to provide suitable grazing habitat for both groups. Section 3.10 provides a detailed description of impacts on livestock and wildlife.

General access to and across the disturbance areas for recreation, ranching, and oil and gas development would be restricted or eliminated during mining and reclamation. Following reclamation bond release, management of the privately owned surface would revert to the private surface owner.

3.11.2.2. *Alternative 1 (No Action)*

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have the same impacts as those described under the Proposed Action. As discussed in section 2.2.2, a decision to reject the coal

lease application would not preclude an application to lease a tract in the general analysis area in the future.

3.11.2.3. *Alternative 2*

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) and mine-related activities in the support area (926 acres) would have the same impacts as those described under the Proposed Action. Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases also would have the same impacts.

This alternative could have impacts on public use of the Collins and McGee roads, if one or both were closed or relocated; however, Kiewit does not anticipate pursuing either option. Section 3.15 contains additional information regarding impacts on transportation.

3.11.3. Regulatory Compliance, Mitigation, and Monitoring

If one of the action alternatives is implemented, mined areas will be reclaimed as specified in the approved mine permit reclamation plan to support the primary postmining land uses of wildlife habitat and livestock grazing. Reclamation of agricultural pastures and croplands may occur, but is highly dependent on the postmine topography and landowner agreements. Mining and reclamation procedures would include stockpiling and replacing topsoil, using reclamation seed mixtures approved by the WDEQ, and replacing stock reservoirs to assure full use of all grazing and wildlife habitat restored under reclamation.

Steps to control invasive nonnative plant species using chemical and mechanical methods would be included in the amended mine plan. Revegetation growth and diversity would be monitored until the final reclamation bond is released (a minimum of 10 years following seeding with the final seed mixture). Erosion would be monitored to determine if corrective action is needed during vegetation establishment. Controlled grazing would be used during revegetation to determine the suitability of the reclaimed land for anticipated postmining land uses.

See section 3.3.3.3 for discussion of regulatory requirements, mitigation, and monitoring related to oil and gas development.

The reclamation standards required by SMCRA and Wyoming state law meet the standards and guidelines for healthy rangelands for public lands administered by the BLM in Wyoming.

3.11.4. Residual Impacts

No residual impacts on land use and recreation are expected.

3.12. Cultural Resources and Native American Consultation

This section describes cultural resources, including Native American resources, in the general analysis area, and identifies impacts on these resources that could result from the Proposed Action and alternatives.

3.12.1. Cultural Resources

3.12.1.1. *Affected Environment*

Cultural resources represent the nonrenewable remains of past human activity. The PRB, including the general analysis area, has been inhabited by hunting and gathering populations for at least 13,000 years. Throughout prehistory, groups of mobile hunters and gatherers depended on the wide variety of plant and animal resources for their survival.

Chronology

Frison's (1978, 1991) chronology for the Northwestern Plains divides the occupation of the area into the Paleoindian, Early Plains Archaic, Middle Plains Archaic, Late Plains Archaic, Late Prehistoric, Protohistoric, and Historic periods.

- Paleoindian period (13,000 to 7,000 years before present [B.P.])
- Early Plains Archaic period (7,000 to 5,000–4,500 years B.P.)
- Middle Plains Archaic period (5,000 to 4,500–3,000 years B.P.)
- Late Plains Archaic period (3,000 to 1,850 years B.P.)
- Late Prehistoric period (1,850 to 400 years B.P.)
- Protohistoric period (400 to 250 years B.P.)
- Historic period (250 to 120 years B.P.)

The Paleoindian period includes a number of cultural complexes that are associated with distinctive styles of lanceolate or stemmed projectile points (Frison 1978). On the Northwestern Plains, the Paleoindian period is synonymous with the "big game hunting tradition," in which large mammals such as bison and mammoth were hunted. Evidence for the use of vegetal resources is present among Paleoindian populations occupying the Black Hills and Big Horn Mountains.

Projectile point styles from the Early Plains Archaic period reflect a change from the large lanceolate and stemmed projectile points characteristic of the Paleoindian Period to large side- or corner-notched types. The subsistence pattern reflects use of a broad spectrum of resources and a much-diminished use of large mammals.

The onset of the Middle Plains Archaic is defined by the appearance of the McKean Techno Complex around 4,900 years B.P. (Frison 1978, 1991, 2001). McKean Complex projectile points include the Duncan and Hanna stemmed variants as well as the McKean lanceolate type.

These point types were used until 3,100 years B.P. when they were replaced by a variety of corner-notched points (Pelican Lake and Besant) (Martin 1999). Sites dating from this period exhibit a continued emphasis on plant procurement and processing.

The Late Plains Archaic is generally defined by the appearance of corner-notched dart points. These projectile points dominate most assemblages until the introduction of the bow and arrow around 1,500 years B.P. (Frison 1991). The period witnessed the continued expansion of groups into the interior basin grasslands as well as the foothills and mountains.

The Late Prehistoric period (1,850–400 years B.P.) is marked by a transition in projectile point technology around 1,500 years B.P. The corner-notched and side-notched dart points characteristic of the Late Plains Archaic are replaced by smaller corner- and side-notched points for use with the bow and arrow. Ceramic technology also appears. Around 1,000 years B.P., the entire Northwestern Plains appears to have suffered an abrupt collapse or shift in population (Frison 1991). This population shift may reflect a narrower subsistence base focused on the communal hunting of pronghorn and bison.

The Protohistoric period (400 to 250 years B.P.) marks the beginning of Euro American influence on the aboriginal cultures of the Northwestern Plains. Additions to the material culture include the horse and European trade goods such as glass beads, metal, and firearms. Projectile points of this period include side-notched, tri-notched, and un-notched points, with the addition of metal points. Groups occupying the basin at this time appear to have practiced a highly mobile settlement strategy.

The Historic period (250 to 120 years B.P.) is summarized from Schneider et al. (2000). The Oregon Trail brought numerous pioneers through Wyoming, but few stayed. It was not until the cattle industry developed in the late 1860s that what is now Wyoming became attractive for settlement. The region offered abundant grazing lands for raising livestock that could be shipped across the country via the recently completed (1867–1868) transcontinental railroad.

Settlement of the region surrounding Gillette, Wyoming, began in the late 1800s, after the Fort Laramie Treaty in 1876 placed the Sioux on reservations outside the territory. Cattlemen were the first settlers to establish themselves in the area, with dryland farmers entering the area after 1900. The town of Gillette was established by the railroad in 1891 to promote the settlement of undeveloped areas along the rail lines. The presence of the railroad allowed the cattle industry to further develop because it facilitated shipping cattle from the area. Several early ranches established in the region include the 4J Ranch (1875), Half Circle L Ranch (1880s), I Bar U Ranch (1888), and the T7 Ranch (1881).

The dryland farming movement of the late nineteenth and early twentieth centuries had a profound effect on the settlement of the PRB during the years around World War I. Although the principles of dryland farming were sound, success still required a certain amount of precipitation each year. Wyoming encouraged dryland settlement of its semi-arid lands through a Board of Immigration created in 1911. Newspapers extolled the virtues of dryland farming,

and railroads conducted well-organized advertising campaigns on a nationwide basis to settle the regions through which they passed.

The most intensive period of homesteading activity in the eastern PRB occurred in the late 1910s and early 1920s. Promotional efforts by the state and the railroads, the prosperous war years for agriculture in 1917 and 1918, and the Stock Raising Act of 1916 with its increased acreage (but lack of mineral rights) all contributed to this boom period. A large number of land filings consisted of existing farms and ranches expanding their holdings in an optimistic economic climate. However, an equally large number of homesteaders had been misled by promotional advertising and were not adequately prepared for the experiences that awaited them in the PRB. It soon became apparent to the would-be dryland farmer that he could not make a living by raising only crops. Some were initially successful in growing wheat, oats, barley, and other small grains, along with hay, alfalfa, sweet clover, and other grasses for the increased number of cattle.

A drought in 1919 was followed by a severe winter, and market prices fell in the spring of 1920. Those homesteaders who were not ruined by the turn of events often became small livestock ranchers and limited their farming to growing forage crops for their livestock and family garden plots. Some were able to obtain cheap land as it was foreclosed or sold for taxes. During the 1920s, the size of homesteads in Wyoming nearly doubled and the number of homesteads decreased, indicating the shift to livestock raising (LeCompte and Anderson 1982).

With serious drought beginning in 1932, Weston, Campbell, and Converse counties were eligible for a drought relief program. The Northeast Wyoming Land Utilization Project began repurchasing the low value homestead lands and making the additional acres of government land available for lease. This helped the small operator expand his grazing land. Cropland taken out of production could be reclaimed and added to the grazing lease program. Grazing associations were formed to regulate grazing permits. In 1934, the Agricultural Adjustment Administration began studying portions of Converse, Campbell, Weston, Niobrara, and Crook counties. In all, 2 million acres were included in the Thunder Basin Project (LA-WY-1). Nationally, the program hoped to shift land use from farms to forest, parks, wildlife refuges, or grazing districts. In marginal agricultural areas, cash crops were replaced by forage crops, the kind and intensity of grazing was changed, and the size of operating units was expanded (USDA Forest Service n.d.).

During the development program to rehabilitate the range, impounding dams were erected, wells were repaired, springs developed, and homestead fences were obliterated while division fences were constructed for the new community pastures. Farmsteads were destroyed and the range reseeded. Remaining homesteaders and ranchers often purchased or scavenged materials from the repurchased farmsteads. Pits were dug on some homesteads and machinery and demolished buildings buried (many of these were dug up during the World War II scrap drives). Ironically, the rehabilitation project used a labor pool of former farmers who had spent years building what the government paid them to destroy. Their efforts were so successful that almost no trace remains of many homesteads.

While counties lost much of their population base as a result of the Resettlement Administration relocation program, they were strengthened financially through school closings, limiting road maintenance to main arterioles, and receipt of delinquent taxes payments. The remaining subsidized ranches were considerably larger and provided a stabilizing effect on the local economies. Three grazing associations were formed: the Thunder Basin Grazing Association, the Spring Creek Association, and the Inyan Kara Grazing Association. These associations provided more responsible management of the common rangeland than in earlier years.

Early fur trappers noted the presence of coal in Wyoming in the mid 1800s and in northeastern Wyoming as early as the 1830s. The oldest coal mines in Wyoming were established along the Union Pacific Railroad; however, transportation systems were not developed in northeastern Wyoming until after the Fort Laramie Treaty in 1876. In the vicinity of Gillette, local ranchers and settlers mined coal in the area for their own use. Similar to the history described for the cattle industry and ranching, once the railroad arrived commercial development of coal mining began. Steam locomotives were the major consumer of coal in northeastern Wyoming, and coal production accelerated during World War II. Annual coal production declined after the war when the railroads transitioned from steam- to diesel-powered locomotives. In 1965, the demand for low-sulfur coal increased for use in power plants, and coal leasing began at an intensive level (Rosenberg 1990).

Files Search and Class III Cultural Resources Surveys

A files search is conducted through the Wyoming State Historic Preservation Office (SHPO) prior to beginning field surveys for all new projects. The files search determines if the area has been previously surveyed and identifies any known cultural resources in the area. The files are accessible only by qualified archaeologists with appropriate clearance from the agency.

A Class III cultural resources survey is an intensive and comprehensive pedestrian inventory of a proposed project area conducted by professional archaeologists and consultants. The survey is designed to locate, identify, and record all prehistoric and historic cultural properties 50 years and older that have exposed surface manifestations. These cultural properties are then evaluated for eligibility for inclusion in the National Register of Historic Places (NRHP). Properties must be recorded at a sufficient level to allow for this evaluation. Determinations of eligibility are made by the managing federal agency in consultation with the SHPO. If a property is determined to be not eligible for inclusion in the NRHP, no further work is required and the property can be disturbed without any further analysis or mitigation. Consultation with the SHPO must be completed before the mining plan can be approved.

Eighteen cultural resource surveys have been conducted in the vicinity of the general analysis area. Eleven of the surveys are associated with expansion of the Buckskin Mine and seven were conducted for other activities as follows: one pipeline project, one power line project, one seismic line project, two CBNG developments, and two conventional oil well developments. In November 2007, a Class III cultural resource survey was conducted in the portion of the general analysis area that had not been previously surveyed: sections 7, 9, 18, and 19 of T52N R72W and

sections 12, 13, and 24 of T52N R73W. The 2007 survey was conducted over an area of approximately 920 acres (Newberry 2008).

A total of 19 cultural sites have been documented in the vicinity of the Buckskin Mine. Of these, 14 are located in the general analysis area (table 3.12-1). One isolated find was recorded and one previously recorded site, 48CA1832, could not be located during the 2007 survey.

Table 3.12-1. Cultural Sites Previously Identified in the General Analysis Area

Site Number	NRHP Status	Author(s)/Organization	Report/Study Name	Year	Site Type
48CA862	NE	University of Wyoming	Buckskin Mine	1980	P
48CA865	NE	University of Wyoming	Buckskin Mine	1980	P
48CA868	NE	University of Wyoming	Buckskin Mine	1980	P
48CA1828	NE	High Plains Consultants	Spring Draw Survey	1982	P
48CA1830	NE	High Plains Consultants	Spring Draw Survey	1982	H
48CA1832	NE	High Plains Consultants	Spring Draw Survey	1982	H
48CA1834	NE	High Plains Consultants	Spring Draw Survey	1982	H
48CA2223	NE	LTA Incorporated	Exxon Carbon Dioxide Pipeline Project Segment 2	1985	P
48CA3376	NE	TRC/Mariah Associates	Class III Inventory of the Hay Creek Tract Buckskin Mine	2000	H
48CA3898	NE	TRC/Mariah Associates	Triton Coal Company LLC Buckskin Mine Lease Expansion	2001	P
48CA6360	NE	Ecosystems Management	Buckskin Mining Company Hay Creek II	2006	H
48CA6361	NE	Ecosystems Management	Buckskin Mining Company Hay Creek II	2006	H
48CA6362	NE	Ecosystem Management	Buckskin Mining Company Hay Creek II	2006	H
48CA6797	NE	Antiquus Cultural Resource Consulting	Hay Creek II LBA	2007	H

NRHP = National Register of Historic Places; NE = Not eligible for the National Register of Historic Places

Site types: P = prehistoric; H = historic

Source: Newberry 2008.

The entire general analysis area has been inventoried for cultural resources at a Class III level. Of the 14 sites identified in that area, 6 are prehistoric and 8 are historic (Newberry 2008). All of the prehistoric sites are determined not eligible for the NRHP. No further protection is afforded these sites and no further work is required. Historic site categories documented in the general analysis area fall under the context of rural settlement. Specifically, the historic sites in the general analysis area are associated with homesteading and stock-raising circa the 1910s to the 1940s. All of the historic sites are determined not eligible for listing on the NRHP. No further protection is afforded these sites and no further work is required.

3.12.1.2. Environmental Consequences

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mine-related activities in the support area (241 acres) would have no impact on known cultural resources or known unevaluated sites. Activities in the remainder of the overlap area (474 acres) related to mining existing coal leases also would have no impact on known cultural resources.

Up to 6 known prehistoric sites and 8 known historic sites would be destroyed as a result of mining and support activities under this alternative. All of these sites were determined to be not eligible for inclusion in the NHRP. Additional ineligible sites discovered during operations may be destroyed without protection or further work. Impacts on eligible sites discovered during operations would be avoided or mitigated through data recovery prior to mining. Impacts on unevaluated sites are not permitted; unevaluated sites would be evaluated prior to mining.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have no impact on known cultural resources or known unevaluated sites. As discussed in section 2.2.2, a decision to reject the lease application would not preclude an application to lease a tract in the general analysis area in the future.

No eligible or ineligible sites are known to exist in the overlap area. Ineligible sites discovered during operations may be destroyed without protection or further work. Impacts on eligible sites discovered during operations would be avoided or mitigated through data recovery prior to mining. Impacts on unevaluated sites are not permitted; unevaluated sites would be evaluated prior to mining.

Alternative 2

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) and mine-related activities in the support area (926 acres) would have no impact on known cultural resources. Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases also would have no impact on known cultural resources or known unevaluated sites.

Up to 6 known prehistoric sites and 8 known historic sites would be destroyed as a result of mining and support activities under this alternative. All of these sites were determined to be not eligible for inclusion in the NHRP. Additional ineligible sites discovered during operations may be destroyed without protection or further work. Impacts on eligible sites discovered during operations would be avoided or mitigated through data recovery prior to mining. Impacts on unevaluated sites are not permitted; unevaluated sites would be evaluated prior to mining.

3.12.1.3. Regulatory Compliance, Mitigation, and Monitoring

Class I and Class III surveys are conducted prior to disturbance to identify cultural resources on all lands affected by federal undertakings, including leasing of federal minerals. All cultural sites documented in the general analysis area during surveys associated with this EIS were determined to be not eligible for listing on the NRHP. Therefore, these sites are afforded no further protection and no further work is required before mining can begin.

Mining activities are monitored during topsoil stripping and other surface-disturbing activities. If previously unknown cultural resources are discovered during these operations, Buckskin will stop all activity in that vicinity until a qualified archaeologist can evaluate the find. If the archeologist determines it is warranted, SHPO is consulted to further evaluate the eligibility of the discovery for inclusion on the NRHP. Cultural resources that are determined to be eligible for the NRHP would be avoided or, if avoidance is not possible, a recovery plan would be implemented prior to disturbance and data would be collected (recorded or excavated) from the site(s) prior to removal. If a lease is issued under either of the action alternatives, the BLM would attach a stipulation requiring the lessee to notify appropriate state and federal personnel if cultural materials are uncovered during mining operations. This stipulation is included in appendix E. Full consultation with SHPO must be completed prior to approval of a mining plan.

3.12.1.4. Residual Impacts

No cultural resources eligible for listing on the NRHP have been formally identified and recorded in the general analysis area to date. If either of the action alternatives is implemented, sites determined to be ineligible for the NRHP would be permanently removed as a result mining. If cultural resources are discovered in the future that are determined to be eligible for the NRHP and cannot be avoided, they would be permanently removed as a result of mining.

Although cultural resources that are not removed or that remain undiscovered prior to disturbance would be permanently destroyed by surface coal mining operations, the analyses (e.g., intensive pedestrian inventories, site evaluations and excavation, and analysis of prehistoric cultural resources) required prior to implementation of these activities provide substantial information and a better understanding regarding existing resources and local prehistory in the region.

3.12.2. Native American Consultation

3.12.2.1. Affected Environment

Native American heritage sites can be classified as prehistoric or historic. Some may be presently in use as offering, fasting, or vision quest sites. Other sites of cultural interest and importance may include rock art, stone circles, various rock features, fortifications or battle sites, burials, and locations that are sacred or part of the oral history and heritage but possessing no human-made features.

No Native American heritage, special interest, or sacred sites have been formally identified and recorded in the general analysis area to date. However, the geographic position of the general analysis area between mountains considered sacred by various Native American cultures (the Big Horn Mountains to the west, the Black Hills to the east, and Devil's Tower to the north) creates the possibility that existing locations may have special religious or sacred significance to Native American groups.

3.12.2.2. *Environmental Consequences*

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mine-related activities in the support area (241 acres) would have no impact on known Native American heritage sites. Activities in the remainder of the overlap area (474 acres) related to mining existing coal leases also would have no impact on such sites.

No Native American heritage, special interest, or sacred sites have been formally identified and recorded in the proposed tract, support area, or overlap area to date.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have no impact on known Native American heritage sites because none are known to be present in the area. As discussed in section 2.2.2, a decision to reject the lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) and mine-related activities in the support area (926 acres) would have no impact on known Native American heritage sites. Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases also would have no impact on such sites.

No Native American heritage, special interest, or sacred sites have been formally identified and recorded in the general analysis area to date.

3.12.2.3. *Regulatory Compliance, Mitigation, and Monitoring*

The following tribes have been identified as groups with potential concerns about actions in the PRB: Crow, Northern Cheyenne, Shoshone, Arapaho, Oglala Sioux, Rosebud Sioux, Crow Creek Sioux, Lower Brule Sioux, Standing Rock Sioux, Cheyenne River Sioux, Apache Tribe of Oklahoma, Comanche Tribe of Oklahoma, and Kiowa Tribe of Oklahoma. Copies of the EIS have been sent to these tribal governments and representatives. They are also being provided with more specific information about the known cultural sites in the general analysis area. Their help is being requested in identifying potentially significant Native American heritage, special

interest, or sacred religious or cultural sites in the general analysis area before a leasing decision is made on the Hay Creek II application.

Native American tribes were consulted at a general level in 1995–1996 as part of an update to the BLM Buffalo Resource Area RMP. Some of the Sioux tribes were consulted by the BLM on coal leasing and mining activity in the PRB at briefings held in Rapid City, South Dakota, in March 2002.

If Native American heritage, special interest, or sacred sites are discovered in the future in the general analysis area, Buckskin will stop all activity in that vicinity until all appropriate entities have been notified and all steps have been taken to address concerns related to those sites.

3.12.2.4. *Residual Impacts*

Although cultural resources that are not removed or have remain undiscovered prior to disturbance would be permanently destroyed by surface coal mining operations, the analyses (e.g., intensive pedestrian inventories, site evaluations and excavation, and analysis of prehistoric cultural resources) required prior to implementation of these activities provide substantial information and a better understanding regarding existing resources and the local prehistory in the region.

3.13. Visual Resources

This section describes existing visual resources in the general analysis area and identifies impacts that would result from the Proposed Action and alternatives.

3.13.1. Affected Environment

Visual sensitivity levels are determined by the concern of viewers for what they see and the frequency of travel through an area.

Natural views within and into the general analysis area consist mainly of vegetated open landscapes, including rolling mixed-grass prairie, scattered stands of sagebrush, and a small region of rough breaks. Natural views from the general analysis area to the north and west are similar to those within the area. Views to the south and east consist mostly of surface mining activities and facilities. Signs of human use in and near the area include active farming and ranching activities (fences, homesteads, hayfields, croplands, farm equipment, and livestock), tree shelterbelts around residences, CBNG development (pipeline rights-of-way, well shelters, and compressor stations), transportation facilities (roads and railroads), and overhead electric power lines and substations. U.S. Highway 14-16 lies approximately 1 mile to the southwest of the general analysis area. The southern portion of the general analysis area can be viewed from this roadway with the Buckskin Mine storage silos beyond it. The Collins and McGee roads pass through the western half of the general analysis area, and active mining at Buckskin is visible from both roads.

For management purposes, the BLM evaluated the visual resources on lands under its jurisdiction in the 1985 Buffalo RMP (BLM 1985). The inventoried lands were classified into visual resource management (VRM) classes used to describe increasing levels of change within the characteristic landscape. They are defined as follows (BLM 2001a):

- Class I—Natural ecologic changes and very limited management activity is allowed. Any contrast (activity) within this class must not attract attention.
- Class II—Changes in any of the basic elements (form, line, color, texture) caused by an activity should not be evident in the landscape.
- Class III—Contrasts to the basic elements caused by an activity are evident but should remain subordinate to the existing landscape.
- Class IV—Activity attracts attention and is a dominant feature of the landscape in terms of scale.
- Class V—The natural character of the landscape has been disturbed up to a point where rehabilitation is needed to bring it up to the level of one of the other four classifications.

The 2001 RMP Update (BLM 2001a) covers Campbell County and the general analysis. The general analysis area is classified as VRM class IV because of the industrial nature of the energy development and active farming and residential use in the area. The overall natural scenic quality of class IV area is considered relatively low.

Surface coal mines are not considered to be major emitting facilities in accordance with the WDEQ Rules and Regulations (chapter 6, section 4). Therefore, State of Wyoming does not require mines to evaluate their impacts on class I areas, though the BLM does consider such issues during leasing.

3.13.2. Environmental Consequences

3.13.2.1. *Proposed Action*

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mine-related activities in the support area (241 acres) would have a moderate, short-term impact on visual resources during mining. Following reclamation, this alternative would have a minor to moderate, permanent impact on terrain and a minor, long-term impact on approximately 46 non-contiguous acres of sagebrush in these areas. Activities in the remainder of the overlap area (474 acres) related to mining existing coal leases would have the same impact on most resources as the Proposed Action, with a minor, long-term impact on approximately 80 non-contiguous acres of sagebrush.

No visual resources that are unique to this area have been identified in or near the proposed tract. Coal extraction operations would be within 1 mile of and visible from U.S. Highway 14-16; mine support activities such as topsoil stripping and stockpiling could be 0.25 mile closer to the highway. Mining activities would encroach to within 100 feet of the eastern right-of-way of the

Collins Road (section 3.15). The road would remain in its existing alignment, but mined areas immediately east of the right-of-way would be lowered during and after mining operations. The areas disturbed under the Proposed Action would be considered VRM class V prior to reclamation. Reclamation would restore these areas to at least the premining VRM class IV conditions.

Reclaimed land would resemble the surrounding undisturbed terrain, although slopes might appear smoother (less intricately dissected) and the vegetation would be more homogenous for several years. Sagebrush comprises approximately 126 non-contiguous acres of the area associated with the Proposed Action, with an average patch size of 4.9 acres.

3.13.2.2. *Alternative 1 (No Action)*

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have the same impact on most resources as the Proposed Action, with a minor, long-term impact on approximately 86 non-contiguous acres of sagebrush. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

No visual resources that are unique to this area have been identified in or near the overlap area. The current VRM class designations for the mine would not change. Impacts on the terrain and sagebrush habitats in the overlap area would be the same as those described under the Proposed Action, but would affect approximately 86 non-contiguous acres of shrubs.

3.13.2.3. *Alternative 2*

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) and mine-related activities in the support area (926 acres) would have a moderate, short-term impact on visual resources during mining. Following reclamation, this alternative would have a minor to moderate, permanent impact on terrain and a minor, long-term impact on approximately 302 non-contiguous acres of sagebrush in these areas. Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases would have the same impact on most resources as the Proposed Action, with no impacts on sagebrush.

No visual resources that are unique to this area have been identified in or near the general analysis area. Coal extraction would be within 0.5 mile of and visible from U.S. Highway 14-16; mine support activities such as topsoil stripping and stockpiling could be 0.25 mile closer to the highway. Mining activities would encroach to within 100 feet of the eastern rights-of-way for both the Collins and McGee roads (section 3.15). The roads would remain in their existing alignments, but adjacent mined areas would be lowered during and after mining operations. Mining could only occur between and west of these two roads if they were closed or relocated, as described in section 2.2.1.1 and section 2.2.3.1. Kiewit does not anticipate pursuing either of those options, and neither road is expected to be disturbed under this alternative. During mining and prior to reclamation, areas disturbed under Alternative 2 would be considered VRM class V;

after reclamation they would be restored to at least their premining VRM class IV condition. Impacts on the terrain and sagebrush habitats in the general analysis area would be the same as those described under the Proposed Action, but would affect approximately 302 non-contiguous acres of shrubs.

3.13.3. Regulatory Compliance, Mitigation, and Monitoring

Landscape character would be restored during reclamation to resemble the original contours. Disturbed areas would be reseeded with an approved seed mixture that includes native species.

Section 3.2 and section 3.9 provide more detailed discussions of the regulatory requirements, mitigation, and monitoring for topography and vegetation, respectively.

3.13.4. Residual Impacts

No residual impacts on visual resources are expected.

3.14. Noise

This section describes existing conditions in the general analysis area associated with noise, and identifies impacts that would occur under the Proposed Action and alternatives.

3.14.1. Affected Environment

The affected environment is described for noise in the general analysis area and vicinity.

3.14.1.1. *Noise Terminology*

A decibel (dB) is the unit of measure used to represent sound pressure levels. The A-weighted decibel (dBA) is a measure designed to simulate human hearing by placing less emphasis on lower frequency noise, because the human ear does not perceive lower frequencies in the same manner as higher frequencies. Figure 3.14-1 presents noise levels associated with some commonly heard sounds. Short-term noise, lasting from several seconds to several hours, is quantified by the equivalent noise level (L_{eq}). The 24-hour average noise levels are quantified as "day-night" noise levels.

3.14.1.2. *Noise-Sensitive Areas*

For the purposes of this noise analysis, noise-sensitive areas have been categorized into the following groups. Map 3.4-4A and shows the occupied residences in and near the general analysis area discussed in this section; map 3.4-4B zooms in on the residence to the west and southwest of the general analysis area.

HOW IT FEELS	EQUIVALENT SOUNDS	DECIBELS	EQUIVALENT SOUNDS	HOW IT SOUNDS
Near permanent damage level from short exposures	50 hp siren (100 ft)		Jackhammer	
	Jet engine (75 ft)	130	Chainsaw	135 dB(A) Approx. 64 times as loud as 75dB(A)
Pain to ears	Turbo-fan jet at takeoff power (100ft)	120	Fire cracker (15 ft.)	125 dB(A) Approx. 32 times as loud as 75dB(A)
Uncomfortably loud	Scraper-loader	110	Rock and roll band	
	Jet fly over (1000 ft)		Unmuffled motor bike (2-3 ft.)	115 dB(A) Approx. 16 times as loud as 75dB(A)
Discomfort threshold	Noisy newspaper press	100	Car horn	
Very loud	Air compressor (20 ft)		Unmuffled cycle (25 ft.)	105 dB(A) Approx. 8 times as loud as 75dB(A)
Conversation stops	Power lawnmower	90	Garbage trucks and city buses	
	Steady flow of freeway trafic		Diesel truck (25 ft.)	95 dB(A) Approx. 4 times as loud as 75dB(A)
Intolerable for phone use	10-HP outboard motor	80	Garbage disposal	
	Automatic dishwasher		Food blender	85 dB(A) Approx. 2 times as loud as 75dB(A)
Extra auditory physiological effects	Vacuum cleaner	70	Muffled jet ski (50 ft.)	
	Window air conditioner outside at 2 ft.		Passenger car 65 mph (25 ft)	75dB(A)
	Window air conditioner in room	60	Busy downtown area	
Quiet	Occasional private auto at 100 ft.	50	Normal conversation	55 dB(A) Approx. 1/4 as loud as 75dB(A)
Sleep interference	Quiet home during evening	40		45 dB(A) Approx. 1/8 as loud as 75dB(A)
	Bird calls			
	Library	30		35 dB(A) Approx. 1/16 as loud as 75dB(A)
	Soft whisper 5 ft.		In a quiet house at midnight	
		20		
	Leaves rustling	10		

Danger to hearing

Very quiet

No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Figure 3.14-1

Relationship Between A-Weighted Decibel Readings and Sounds of Daily Life

Occupied Residences within the General Analysis Area

One occupied residence is located within the general analysis area, less than 0.25 mile north of the existing mine permit area (map 3.4-4A). This residence is in direct line-of-sight of the current mine pit and associated support activities (e.g., topsoil stripping, soil stockpiling). The lack of obstacles between the residence and mine operations results in no buffering of noise generated at the mine.

Occupied Residences North of the General Analysis Area

These four residences range from 1.5 to 2.5 miles north of the general analysis area, and at least 2 miles north of the existing mine permit boundary (map 3.4-4A). The high rolling terrain between these residences and the general analysis area blocks their line-of-sight and creates a buffer from noise generated by current mine operations.

Occupied Residences along U.S. Highway 14-16 and West of the General Analysis Area

The nearest of these residences is approximately 0.5 mile west of the general analysis area (map 3.4-4B) and approximately 1.5 miles from overlap between the general analysis area and the Buckskin Mine permit area (map 3.4-4A). The small Green Valley Estates subdivision is immediately west of Highway 14-16, approximately 0.75 mile from the general analysis area and 1.75 miles from the majority of its overlap with the permit boundary. The high rolling terrain between these residences and the general analysis area provides a visual and audio buffer from current and future mine operations.

Occupied Residences along U.S. Highway 14-16 and Southwest of the General Analysis Area

The nearest of these residences is within the existing permit area, approximately 0.25 mile west of the general analysis area (map 3.4-4B); this residence is immediately north of an existing coal lease (map 3.0-1). The Pineview Ranchettes and Bredthauer subdivisions lie mostly to the west of U.S. Highway 14-16, less than 0.25 mile from the Collins Road and the western limit of the existing Buckskin Mine permit area (map 3.4-4B). One house in the Pineview Ranchettes subdivision lies between the highway and the permit boundary, approximately 0.5 mile west of the general analysis area. The residence within the permit area is on the far side of a hill that separates it from all but the extreme southwestern corner of the general analysis area. Most of the residences in the two subdivisions are on a hillside above the rolling terrain to the northeast. Their line-of-sight to both the general analysis area and the existing permit area is generally unobstructed, so few potential buffers from mine-related noise are present. However, nearly all of the residences in this area are adjacent to and west of Highway 14-16, a well-traveled major highway and, thus, are currently exposed to regular traffic noise.

3.14.1.3. *Existing Noise Sources and Existing Noise Levels*

Existing noise sources in the general analysis area include coal mining activities, traffic on Highway 14-16 and the Collins and McGee roads, mine-related rail traffic along the rail spur serving the mines, wind, and CBNG activities and facilities.

Noise originating from CBNG development equipment (e.g., drilling rigs and construction vehicles) and production facilities (e.g., well sites and compressor stations) is apparent locally over the short term (i.e., 30 to 60 days) where well drilling and associated construction activities occur. The amount of noise overlap between well sites is variable and depends on the timing of drilling activities on adjacent sites and the distance between the site locations.

No baseline noise studies have been conducted for existing noise levels at the northern and western residences nearest the general analysis area, and no site-specific noise level data are available for the general analysis area. Studies of background noise levels at other PRB mines indicate that ambient sound levels generally are low, owing to the isolated nature of the area. Because the general analysis area is immediately adjacent to an operating mine, the current median noise level is estimated to be between 40 and 60 dBA, with the noise level increasing with proximity to active mining operations. Mining activities are characterized by noise levels of between 85 and 95 dBA at 50 feet from actual mining operations and activities.

The residences in the general analysis area and the one in the permit area are both close to ongoing mine operations and county or federal road systems. Noise at these two residences is likely dominated by sources from the Buckskin Mine and public roads. The three subdivisions are close to other neighboring residences and Highway 14-16. Therefore, existing noise levels at those residences are likely dominated by traffic and ranching or suburban noise sources.

3.14.2. Environmental Consequences

The assessment of noise impacts from the Proposed Action and alternatives focuses on the following related noise issues:

- increased noise levels at residences with a direct line-of-sight to and within 0.25 to 0.5 mile of new mining activity;
- noise impacts on wildlife;
- increased railroad noise along the rail spur serving the mine; and
- hearing protection for mine workers.

The Noise Control Act of 1972 indicates that a 24-hour equivalent noise level ($L_{eq}[24]$) of less than 70 dBA prevents hearing loss, and that an outdoor day-night level (L_{dn}) below 55 dBA, in general does not constitute an adverse impact (EPA 1974).

3.14.2.1. *Proposed Action*

Increased Noise Levels at Occupied Residences

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mine-related activities in the support area (241 acres) would have a minor to substantial, short-term impact on noise levels, depending on the location of occupied residences relative to operations. Activities in the remainder of the overlap area (474 acres) related to mining existing coal leases would have the same impact on noise as the Proposed Action.

Within the General Analysis Area

The nearest occupied residence is less than 0.25 mile from the overlap area (map 3.4-4A). As coal extraction moves incrementally away from existing leases south toward the proposed tract, noise associated with mining would also move away from that residence.

North of the General Analysis Area

Mining and related activities would remain at least 2 miles from the nearest residence under the Proposed Action (map 3.4-4A). High terrain between these residences and the proposed tract would provide a visual and audio barrier from mine operations.

West of the General Analysis Area

Under the Proposed Action, mining and mine support activities associated with the proposed tract and support activities in the remainder of the overlap area would remain at least 0.75 mile from the nearest residence and 1.25 miles from the nearest subdivision (map 3.4-4A and map 3.4-4B). High terrain and an active highway located between the residences and the proposed tract provide visual and audio buffers from current and future mine-related noise.

Southwest of the General Analysis Area

Under the Proposed Action, mining and mine support activities associated with the proposed tract and support activities in the remainder of the overlap area would be at least 0.75 mile from the majority of occupied residences, One residence would be approximately 0.5 mile west of the overlap area but within the existing permit area (map 3.4-4B) and immediately adjacent to an existing lease. Few natural buffers from mine-related noise are present between the majority of residences in this area and current or future mine operations. However, nearly all of the residences in this area are adjacent to and west of a well-traveled major highway and, thus, are currently exposed to regular traffic noise.

Noise Impacts on Wildlife

Under the Proposed Action, wildlife in the immediate vicinity of the proposed tract would continue to be exposed to noise from mine-related activities, but noise levels are not expected to increase. Anecdotal observations at surface coal mines in the area indicate that wildlife may adapt to increased noise associated with coal mining activity. After mining and reclamation are completed, noise levels would return to premining levels.

Increase in Noise Levels near the Rail Spur

No new railroads or rail loading facilities would be constructed under the Proposed Action; rail car loading would continue at the loadout facility in the existing permit area approximately 1.5 miles southeast of the proposed tract. The nearest occupied residence is approximately 2.25 miles to the northwest, with numerous hills and existing noise sources between the rail spur and the residence. The mines located north of Interstate 90 (including Buckskin) share a common rail spur connecting to the main east-west rail line along the interstate to ship coal to users throughout the United States. No residences are located near the common rail spur north of the railroad junction. Under the Proposed Action, average coal car loading would remain at the

same level as under existing conditions for Buckskin Mine (five trains per day). Railroad noise impacts are usually evaluated by considering the 24-hour average noise increase compared to existing conditions, rather than evaluating short-term L_{eq} noise impacts from each individual train (Federal Transit Administration 2006). Because the average number of coal trains would not increase, the Proposed Action would not cause an increase in the 24-hour average noise levels along the rail spur.

3.14.2.2. *Alternative 1 (No Action)*

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have a minor to substantial, short-term impact on noise levels, depending on the location of occupied residences relative to operations. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

The nearest occupied residence is less than 0.25 mile from the overlap area (map 3.4-4A). As coal extraction moves incrementally away from existing leases south toward the proposed tract, noise associated with mining would also move away from that residence.

3.14.2.3. *Alternative 2*

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) and mine-related activities in the support area (926 acres) would have a minor to substantial, short-term impact on noise levels, depending on the location of occupied residences relative to operations. Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases would have the same noise impacts as described under the Proposed Action.

Increased Noise Levels at Occupied Residences

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) and mine-related activities in the support area (926 acres) would have a minor to substantial, short-term impact on noise levels, depending on the location of occupied residences relative to operations. Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases would have the same noise impacts as described under the Proposed Action.

Within the General Analysis Area

Mining activities could eclipse the single occupied residence within the general analysis area (map 3.4-4A) if the McGee road is closed or relocated, as described in section 2.2.3.1. However, Kiewit does not anticipate pursuing road closure or relocation.

North of the General Analysis Area

Mining and related activities would remain at least 1.5 miles from the nearest occupied residence (map 3.4-4A). High terrain between these residences and the general analysis area would provide a visual and audio barrier from mine operations.

West of the General Analysis Area

The majority of mining and mine support activities in the general analysis area would remain at least 0.5 mile from the nearest residence and approximately 1 mile away from the nearest subdivision (map 3.4-4A and map 3.4-4B). High terrain and an active highway located between the residences and the general analysis area provide visual and audio buffers from current and future mine-related noise.

Southwest of the General Analysis Area

Mining and mine support activities within the general analysis area would remain at least 0.25 mile from the nearest residence (map 3.4-4B); that residence is within the permit area and immediately adjacent to an existing lease. Mining activities in the general analysis area would remain at least 0.5 mile from the nearest subdivision. Few potential buffers from mine-related noise are present between most of the residences in this area and current or future mine operations. However, nearly all of the residences in this area are adjacent to and west of a well-traveled major highway and, thus, are currently exposed to regular traffic noise.

Noise Impacts on Wildlife

Under Alternative 2, wildlife in the immediate vicinity of the general analysis area would continue to be exposed to noise from mine-related activities, but noise levels are not expected to increase. Anecdotal observations at surface coal mines in the area indicate that wildlife may adapt to increased noise associated with coal mining activity. After mining and reclamation are completed, noise levels would return to premining levels.

Increase in Noise Levels near the Rail Spur

No new railroads or rail loading facilities would be constructed under Alternative 2; rail car loading would continue at the loadout facility in the existing permit area approximately 1.5 miles southeast of the general analysis area. The nearest occupied residence is approximately 2.25 miles to the northwest of the rail spur, with numerous hills and existing noise sources between it and the residence. The mines located north of Interstate 90 (including Buckskin) share a common rail spur connecting to the main east-west rail line along the interstate to ship coal to users throughout the United States. No residences are located near the common rail spur north of the railroad junction. Under Alternative 2, average coal car loading would remain at the same level as under existing conditions for Buckskin Mine (five trains per day). Railroad noise impacts are usually evaluated by considering the 24-hour average noise increase compared to existing conditions, rather than evaluating short-term L_{eq} noise impacts from each individual train (Federal Transit Administration 2006). Because the average number of coal trains would not increase, this alternative would not cause an increase in the 24-hour average noise levels along the rail spur.

3.14.3. Regulatory Compliance, Mitigation, and Monitoring

Mine operators are required to comply with Mine Safety and Health Administration regulations concerning noise, which include protecting employees from hearing loss associated with noise

levels at the mines. This agency periodically conducts mine inspections to ensure compliance with the requirements of the Federal Mine Safety and Health Act of 1977.

3.14.4. Residual Impacts

No residual noise impacts are expected.

3.15. Transportation

This section describes the affected environment as it relates to transportation in the general analysis area, and identifies impacts that would result from the Proposed Action and alternatives.

3.15.1. Affected Environment

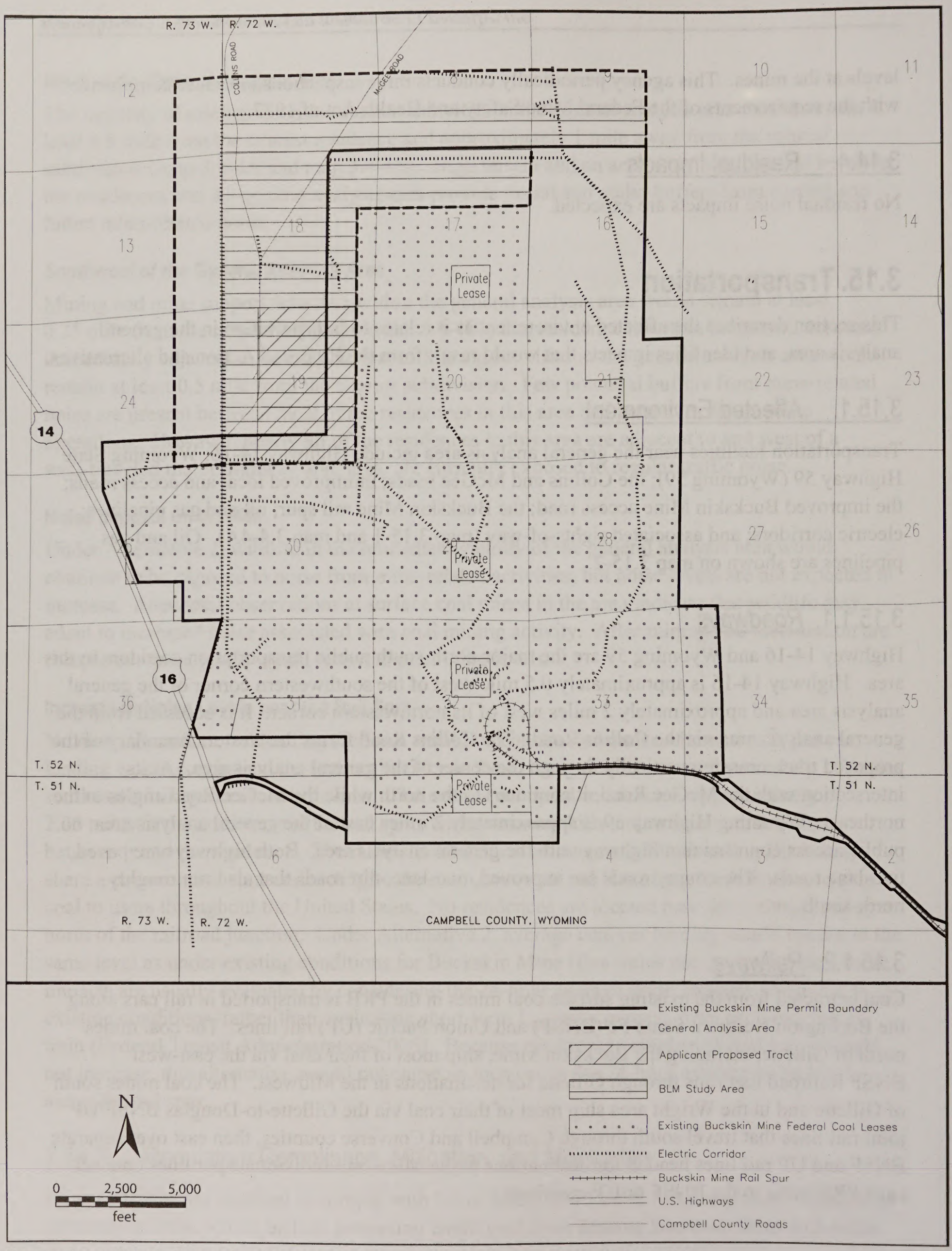
Transportation facilities near the general analysis area include Highway 14-16; Wyoming State Highway 59 (Wyoming 59); the Collins and McGee roads; unimproved local and access roads; the improved Buckskin Mine access road; the Buckskin Mine rail spur; oil and gas pipelines; electric corridors; and associated rights-of-way (map 3.15-1 and map 3.4-4A). Oil and gas pipelines are shown on map 3.15-2.

3.15.1.1. *Roadways*

Highway 14-16 and Wyoming 59 are the major north-south public transportation corridors in this area. Highway 14-16 is approximately 0.5 mile west of the southwestern corner of the general analysis area and approximately 2 miles west of its northwestern corner. It is accessed from the general analysis area via the Collins Road. The Collins Road forms the western boundary of the proposed tract, crossing vertically through the center of the general analysis area. At its intersection with the McGee Road, it continues to the north while the McGee Road angles to the northeast. Wyoming Highway 59 is approximately 2 miles east of the general analysis area; no public access connects that highway with the general analysis area. Both highways are paved, two-lane roads. The county roads are improved, two-lane, dirt roads that also run roughly north-south.

3.15.1.2. *Railways*

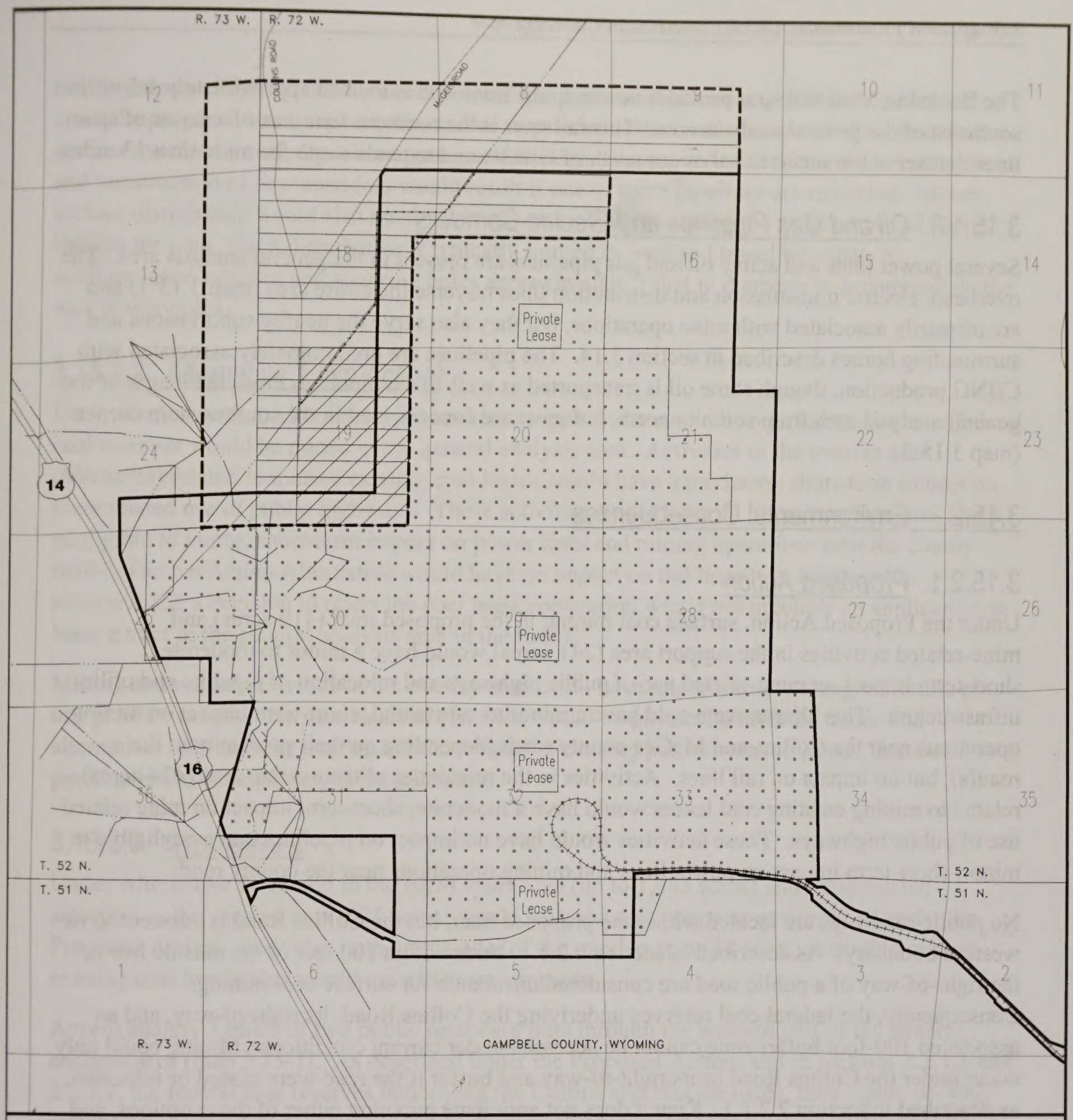
Coal extracted from the existing surface coal mines in the PRB is transported in rail cars along the Burlington Northern Santa Fe (BNSF) and Union Pacific (UP) rail lines. The coal mines north of Gillette, including the Buckskin Mine, ship most of their coal via the east-west BNSF Railroad that runs through Gillette for destinations in the Midwest. The coal mines south of Gillette and in the Wright area ship most of their coal via the Gillette-to-Douglas BNSF/UP joint rail lines that travel south through Campbell and Converse counties, then east over separate BNSF and UP rail lines headed for destinations in the Midwest. Individual spur lines connect each PRB mine to the BNSF or UP mainlines.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 3.15-1

Transportation Facilities in the Vicinity of the General Analysis Area



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 3.15-2

Oil and Gas Pipelines in the General Analysis Area

The Buckskin Mine rail spur provides access to the mine and is located approximately 1.5 miles southeast of the general analysis area. This rail spur is the northern terminus of a series of spur lines that serve the surface coal mines north of Gillette and extends south for more than 13 miles.

3.15.1.3. *Oil and Gas Pipelines and Electric Corridors*

Several power lines and active oil and gas pipelines are present in the general analysis area. The overhead, electric transmission and distribution lines traverse the entire area (map 3.15-1) and are primarily associated with mine operations, but they also serve the nearby subdivisions and surrounding homes described in section 3.14. The pipelines are predominately associated with CBNG production, though some oil is transported as well. Two pipelines cross the length of the general analysis area from south to north, but most are concentrated in the southwestern corner (map 3.15-2).

3.15.2. Environmental Consequences

3.15.2.1. *Proposed Action*

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mine-related activities in the support area (241 acres) would have a minor to moderate, short-term impact on mine-related use of public highways and relocation of pipeline and utility infrastructure. This alternative would have a minor to substantial, short-term impact on mining operations near the Collins and McGee county roads, depending on their proximity to the road(s), but no impact on rail lines. Activities in the remainder of the overlap area (474 acres) related to mining existing coal leases would have a moderate, short-term impact on mine related use of public highways. These activities would have no impact on pipelines and a negligible to minor, short-term impact on power lines and mining operations near the county roads.

No public roadways are located within the proposed tract, but the Collins Road is adjacent to its western boundary. As described in section 2.2.1.1, lands within 100 feet of the outside line of the right-of-way of a public road are considered unsuitable for surface coal mining. Consequently, the federal coal reserves underlying the Collins Road, its right-of-way, and an associated 100-foot buffer zone cannot be accessed under current conditions. Mining could only occur under the Collins Road or its right-of-way and buffer if the road were closed or relocated, as described in section 2.2.1.1. Kiewit does not anticipate pursuing either of those options, and the road and its right-of-way and buffer are not expected to be disturbed under this alternative. Unless an exception is granted to the BLM's prohibition against mining under or immediately adjacent to a public road (coal screening unsuitability criterion 3, section 2.2.1.1), a stipulation would be attached to the lease stating that mining activity would not be conducted within the Collins Road right-of-way or its 100-foot buffer zone. Vehicular traffic to and from the Buckskin Mine would remain at existing levels.

Coal mined in the proposed tract would be transported by rail. Mining would be an extension of existing Buckskin operations, and would rely on existing rail facilities and infrastructure. Annual coal production would not increase under the Proposed Action, nor would the volume of

rail shipments. Portions of four active oil and gas pipelines and one potential new easement cross the proposed tract, support area and/or remainder of the overlap area. Surface disturbance such as overland travel, topsoil stripping, and trenching associated with removal of existing lines and construction of new corridors would result if one or more pipelines are relocated. Minor surface disturbance would also result from relocating and rebuilding the three overhead power lines in the area. Such disturbance is typically limited to overland travel by small- to medium-sized vehicles and augering holes approximately 3 feet in diameter to accommodate the new power poles.

3.15.2.2. *Alternative 1 (No Action)*

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have a moderate, short-term impact on mine related use of public highways. These activities would have no impact on pipelines and a negligible to minor, short-term impact on power lines and mining operations near the county roads. The No Action Alternative would have no impact on rail lines. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Mining and related activities in the overlap area could have minor impacts along 0.25 mile of one public roadway. No new roads or rail lines would be physically affected under this alternative. Because the overlap area is within the existing permit area, all power line and pipeline issues have already been addressed.

3.15.2.3. *Alternative 2*

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) and mine-related activities in the support area (926 acres) would have the same impacts as described under the Proposed Action. Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases also would have the same impacts.

Approximately 3 miles of two public roadways pass through the western half of the general analysis area (map 3.15-1). As described under the Proposed Action, and in sections 2.2.1.1 and 2.2.3.1, the federal coal reserves underlying the Collins and McGee roads, their rights-of-way, and the associated 100-foot buffer zones are considered unsuitable for mining and cannot be accessed unless one or both roads are closed or relocated. Kiewit does not anticipate pursuing either of those options, and neither road is expected to be disturbed under this alternative. Unless an exception is granted to the BLM's unsuitability criterion 3, a stipulation would be attached to the lease stating that mining activity would not be conducted within the rights-of-way or 100-foot buffer zones for these county roads. Vehicular traffic to and from the Buckskin Mine would remain at existing levels.

Coal mined in the final tract configuration would be transported by rail. Mining would be an extension of existing operations and would rely on existing rail facilities and infrastructure. Annual coal production and volume of rail shipments would not increase.

Six existing oil and gas pipelines, one potential new pipeline easement, and eight overhead power lines are present in the general analysis area. Surface disturbance such as overland travel, topsoil stripping, trenching, and augering associated with removal and relocation of infrastructure and facilities would result in varying levels of surface disturbance in current and new locations. If relocation of pipelines or corridors is necessary, it would be handled according to specific agreements between the coal lessee and the pipeline or utility owners. Due to their location within the existing permit area, most, if not all, pipeline and power line issues have already been addressed.

3.15.3. Regulatory Compliance, Mitigation, and Monitoring

Regulatory requirements regarding transportation facilities preclude any public road from being relocated or closed unless the appropriate authority has allowed it. Existing pipelines and oil and gas lines can be relocated, if necessary, in accordance with specific agreements between the coal lessee and the pipeline and utility owners. After mining, the land will be reclaimed to support the premining uses described in section 1.1.3.1. Oil and gas wells, pipelines, and utility easements will be reestablished as required.

3.15.4. Residual Impacts

With the opening of the PRB in Wyoming in the late 1970s, U.S. coal shipments have grown dramatically from 4.8 million carloads to 8.4 million carloads in 2006 as the railroads deliver low-sulfur coal to help electric utilities achieve clean air standards. The largest coal trains are from the PRB to power plants in Illinois, Missouri, and Texas (Federal Railroad Administration 2008).

Shifting and blowing coal dust and coal chunks coming off freshly loaded moving railroad cars can accumulate along railroad tracks, railroad rights-of-way, and on adjacent lands. Coal dust can wash into drainages where large deposits of lost coal can accumulate. Accumulated coal dust has been linked to train derailments and can spontaneously combust and cause wildfires.

Coal can be lost from rail cars through leakage from the rail car discharge doors, spillage over the rail car sides, or it can be blown from rail car tops during transit. In testing conducted by Union Pacific Railroad, BNSF, and the National Coal Transportation Association, the average loss of coal from an individual rail car's rapid discharge doors was about 19 pounds per 216 miles, or 0.09 pound per mile. The same testing indicated that an average of 225 pounds of coal was lost from the top of a coal car through either top spillage or being blown off during a 567-mile test trip, which equated to about 0.4 pound per mile (National Coal Transportation Association 2007).

The derailment of two trains in the PRB in 2005 resulted from track instability problems caused by a buildup of coal dust and other particles on the rail bed in combination with high concentrations of moisture (Union Pacific Railroad 2005). BNSF railway officials toured the PRB rail infrastructure in June 2007. According to a BNSF official, when coal dust is blown off rail cars, it becomes lodged in the rail bed, allowing moisture to intrude. The moisture then degrades the structural stability of the rail bed and leaves the rail more vulnerable to buckling under stress (Gartrell 2007a).

The National Coal Transportation Association (2007) testing results suggested that rail car bottom spillage may have more of a negative impact on rail bed stability than loss from the top of rail cars since the leakage is directly above and near the ballast. The testing also indicated a 32% decrease in bottom spillage of coal after adjustment of the rapid discharge doors.

Accumulating coal dust deposits have become a concern in Converse County. While the coal mines north of Gillette, including the Buckskin Mine, ship most of their coal via the east-west BNSF Railroad to destinations in the Midwest, the majority of coal mined in the PRB travels through Converse County on railroads. Coal dust blows off the freshly loaded coal cars on their way from the mine load-outs to Bill, Wyoming, and through Converse County (Delbridge 2007). The Converse County Board of Commissioners is concerned with the coal dust piles that have accumulated in the county from rail transport of coal.

Spontaneous combustion of accumulated coal dust can cause rangeland fires. Smoldering coal dust in a railroad right-of-way can ignite a wildfire and quickly spread to surrounding private lands if the fire is not immediately controlled. The Douglas Volunteer Fire Department Chief, Rick Andrews, estimates that coal fires account for at least 50% of the department's average summer call volume and are an ongoing problem for them. Often water only temporarily puts down the flames; some fires repeatedly ignite over the course of several hours or days. While the county's rural fire district is compensated for some of the costs involved in putting out fires caused by transported coal, the compensation does not come close to the actual costs, according to the Douglas Volunteer Fire Department Chief (Delbridge 2007).

A Converse County private landowner invited the BLM to examine and survey the coal that had fallen from coal trains traveling through his land. On July 7, 2008, BLM personnel met with the landowner and toured his rangeland, which was adjacent to the railroad right-of-way, about 26 miles north of Douglas, Wyoming. The BLM surveyed various coal accumulations in Box Creek. One area had a coal accumulation 1.8 feet thick. Water runoff washed lost coal from the trains into drainages; the amount of coal deposited varied along the tracks (BLM 2008d).

BNSF is working with the utility companies and the mines to encourage delivery of larger chunks of crushed coal (3-inch versus 2-inch diameter) to reduce the amount of small particles that are created in the crushing process. Another possibility that may help lessen blowing coal dust from trains is the application of surfactant to the tops of loaded coal cars. When applied to coal, the surfactant can stabilize and adhere coal dust to larger coal chunks. Tests have shown that coal dust on railroad tracks can be reduced as much as 95% with surfactant use. The specific surfactant used must meet utility companies' burning specifications (Gartrell 2007a).

A collaborative effort between the National Coal Transportation Association, PRB mines, and BNSF and UP railroads has resulted in an improved design for a coal loading chute that distributes coal more evenly and produces a lower profile load. Preliminary results have demonstrated that this new design may result in a 30% to 60% reduction in coal dust blowing off the top of cars during the early portion of the route (Union Pacific Railroad 2006).

Converse County Commissioners have formally expressed concerns to the BLM regarding fire, health, and safety issues associated with blowing coal dust from trains. They have stated that the health and wellbeing of Converse County citizens downwind of the railroad tracks continue to be jeopardized by the lack of coal dust mitigation in the coal mining permit process. The commissioners have recommended that coal dust mitigation be applied as a standard condition of approval before mining permits are issued (BLM 2008e).

As discussed in section 1.3, the BLM does not authorize mining permits nor does it regulate mining operations with the issuance of a BLM coal lease. WDEQ is the agency that permits mining operations and has authority to enforce mining regulations. In Wyoming, WDEQ has entered into a cooperative agreement with the Secretary of the Interior to regulate surface coal mining operations. Mitigation and other requirements are developed as part of the mining and reclamation permit. These permits and the provisions they contain must be approved by WDEQ before mining of federal coal leases can occur.

Other agencies that may be stakeholders in this issue include the Federal Railroad Administration, which implements U.S. Department of Transportation environmental policies related to railroads in the United States, and the National Coal Transportation Association, whose mission includes facilitating the resolution of coal transportation issues to serve the needs of the general public and industry (National Coal Transportation Association 2008).

3.16. Hazardous and Solid Waste

3.16.1. Affected Environment

Potential sources of hazardous or solid waste could include spilled, leaked, or dumped substances, petroleum products, and solid waste associated with coal and oil and gas exploration, oil and gas development, utility line installation and maintenance, or agricultural activities. No such hazardous or solid wastes are known to be present in the general analysis area. Wastes produced by current mining activities at the Buckskin Mine are handled according to the procedures described in chapter 1, section 1.1.3.5.

3.16.2. Environmental Consequences

3.16.2.1. *Proposed Action*

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mine-related activities in the support area (241 acres) would have a negligible, short-term impact

on hazardous and solid wastes generated by mining operations. Activities in the remainder of the overlap area (474 acres) related to mining existing coal leases would have the same impact as in the proposed tract and support area.

Wastes generated under this alternative would be similar to those currently being created by existing mining operations. Such wastes would be handled in accordance with the existing regulations using the procedures currently in use, and in accordance with WDEQ-approved waste disposal plans at the Buckskin Mine (section 1.1.3.5).

3.16.2.2. *Alternative 1 (No Action)*

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have a negligible, short-term impact on hazardous and solid wastes generated by mining operations. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

3.16.2.3. *Alternative 2*

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) and mine-related activities in the support area (926 acres) would have a negligible, short-term impact on hazardous and solid wastes generated by mining operations. Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases would have the same impact as in the BLM study area and support area.

Hazardous and solid wastes generated in the course of mining an alternative tract configuration would be similar to those currently being created by existing mining operations. Waste handling and disposal procedures would be the same as those described for existing mining operations (section 1.1.3.5), and would be in accordance with WDEQ-approved waste disposal plans at the Buckskin Mine.

3.16.3. Regulatory Compliance, Mitigation, and Monitoring

Kiewit will adhere to the regulatory requirements for production, use, storage, transport, and disposal of solid waste and hazardous or extremely hazardous materials that result from mining activities, described in section 1.1.3.5. All mining activities involving hazardous materials are and would continue to be conducted so as to minimize potential environmental impacts.

3.16.4. Residual Impacts

No residual impacts associated with hazardous and solid waste are expected.

3.17. Socioeconomics

This section describes existing socioeconomic conditions in Campbell County, the City of Gillette, and nearby unincorporated areas and identifies impacts on those conditions that would result from the Proposed Action and alternatives.

3.17.1. Local Economy

3.17.1.1. *Affected Environment*

Wyoming's coal mines set a new annual production record of 466.3 million tons in 2008, an increase of about 14.2 million tons (3.1%) over the record 452.1 million tons produced in 2007. Coal produced from 14 active mines in Campbell and Converse counties accounted for approximately 96% of total statewide coal production in 2008 and virtually all of the gain in statewide production from 2007 to 2008 (Wyoming Department of Employment 2009a).

Energy resource development has been the primary stimulus behind a marked economic expansion across the state in recent years. Recent estimates of the state's gross state product (GSP)[5] highlight the significance of the minerals industry to the statewide economy. Estimates of the 2007 GSP indicate the mining industry, including oil and gas and support activities, accounted for more than 30% of the state's total GSP of $31.5 billion. Statewide GSP climbed by nearly 45% (in nominal dollars) between 2003 and 2007 largely due to the increases in natural gas development and production. The contribution of mining production to the 2007 statewide GSP was more than twice that of the government sector, the next largest sector, and more than three-and-one-half times the contribution of the real estate industry, the next largest private industrial sector (U.S. Bureau of Economic Analysis 2009).

Wyoming, Campbell County, Campbell County School District 1, the City of Gillette, and many other governmental entities across the state receive revenues derived directly and indirectly from taxes and royalties on the production of federal coal, including that at the Buckskin Mine. Such revenues include lease bonus bids, ad valorem taxes, severance taxes, royalty payments, sales and use taxes on equipment and other taxable purchases, and portions of required contributions to the federal AML program and Black Lung Disability Trust Fund. Companies pay lease bonus bids for the right to enter into lease agreements for federal coal.

Current statutorily established allocation formulas presently cap the total annual distributions to local governments from the state's share at levels substantially below the revenues generated by mineral development in the state. Consequently, the bulk of such revenues accrue to the state general fund, budget reserve fund, Permanent Wyoming Mineral Trust Fund, and school foundation and construction budgets. The combined statutory distributions to cities and counties during fiscal year 2007 was $53.5 million, about 2.9% of the total $1.79 billion in federal mineral royalties and severance taxes received by the state. Moreover, distributions to local

[5] GSP is a measure of the total market value of goods and services produced by the labor, capital, and property in the state, after netting out the value of intermediate outputs imported to the state.

government are not earmarked for those local entities where the activities are located or the social and economic effects are felt. Instead, the distributions are made to all cities and counties in the state.

In 1994, a study conducted at the University of Wyoming estimated the total fiscal benefit to the State of Wyoming for coal produced in the PRB at $1.10 per ton (Borden et al. 1994). Calculating the estimated total fiscal benefit to the state in 2005 by including half of the bonus bid payments, half of the federal mineral royalties based on current prices, half of the AML fees, and all of the ad valorem taxes, severance taxes, and sales and use taxes for coal produced in Campbell County in 2005 results in an estimated $661 million, or $1.62 per ton (BLM 2006b).

Revenues to the federal government from leasing and production of federal coal include retention of one-half of the lease bonus bids and federal mineral royalties. Bonus bids are paid in five annual installments, with half returned to the state. In 2004 and 2005, BLM held competitive sealed-bid lease sales for six coal tracts (NARO South, Hay Creek, West Hay Creek, Little Thunder, West Roundup, and NARO North). The successful bonus bids for these six sales ranged from 30 cents per ton to 97 cents per ton and totaled $1.69 billion, including $146.3 million for the Hay Creek tract (BLM 2006b). The bonus bid payments associated with these sales topped $200 million in fiscal year 2006. The remaining bonus bid payments from those past sales, estimated at about $170 million per year to the State of Wyoming, will occur this year and the next fiscal year.

Three sales involving coal in the Wyoming PRB were held in the first four months of 2008. Two of those sales were successful. The Eagle Butte and South Maysdorf tracts yielded bonus bids within the range of the 2004/2005 sales (BLM 2008f). As additional sales are planned, successful sales will generate additional coal lease bonus bid disbursements. Such disbursements to the state are then allocated to fund capital construction projects for cities, towns, and counties; the state's highway fund; community colleges, and schools (Wyoming Consensus Revenue Estimating Group 2007).

Federal mineral royalties (FMR) are collected by the federal government when the produced coal is sold, with a royalty rate equal to 12.5% of the sale price. The federal government retains 51% of the receipts and 49% of the FMR is disbursed to the State of Wyoming. Total FMR disbursements, including coal bonus bid payments to the state in fiscal year 2007 derived from all mineral production (not solely coal), was $927 million (Wyoming Consensus Revenue Estimating Group 2008). In 2006, the Buckskin Mine paid $17.8 million in FMR.

In addition to the FMR, coal mines pay as much as 31.5 cents per ton of surface coal produced to fund AML reclamation programs. The Buckskin Mine payments to the federal mining reclamation program exceeded $6 million in 2006. Historically about 83% of the funds were to be returned to states and tribes with AML problems, subject to adjustments to reflect the actual appropriations authorized by Congress and overall AML program priorities. Future AML payments associated with the proposed coal sales are assumed to be 28.0 cents per ton.

Wyoming historically received about 50% of the AML funds generated by production in the state. Amendments to Title IV of the SMCRA enacted in 2006 altered the structure of the AML program. Under the revised program, Wyoming will receive payments over the next seven years to replace past underpayments stemming from Congressional budget authorizations that were insufficient to fully fund the program. However, the state will not be entitled to receive future distributions from the AML program. Wyoming will receive an equivalent in-lieu amount, of 50%, in the form of grants from general treasury funds. The new funds will be subject to fewer restrictions regarding their use (OSM 2007a, b).

Additional sources of revenue from coal mining include federal corporate and personal income taxes and annual lease rentals paid to the government.

Sales and use taxes are levied by the state and by local governments. Approximately 70% of the revenues generated from the statewide 4.0% levy are retained by the state; the remaining revenues are distributed to the counties, cities, and towns according to statutory formula. In addition, Campbell County levies a 1% general purpose local option tax and a 0.25% specific county option tax. Sales and tax revenues are vital for local governments. Statewide total sales and use tax revenues totaled $922.1 million in fiscal year 2007. Fully $1 of every $6 in statewide sales and use tax receipts was derived directly from economic activity in Campbell County (Wyoming Department of Revenue 2007). A direct accounting of sales and use taxes paid by coal mining firms is not available; however, it is likely substantial given the operating budgets of the mines.

In 2006, the Buckskin Mine had a total payroll, including benefits and incentives, of $19.3 million. In addition, the mine made outlays of nearly $91 million for non-labor operating expenses, capital investments, permits, licenses, fees, royalties, and taxes. Approximately 60% of the latter sum was spent with vendors and suppliers in Wyoming or paid directly to state and local governments. An internal analysis of the Buckskin Mine's outlays yielded an estimated $1.8 million paid in sales and use taxes in 2006. The total payroll includes $31.7 million in federal mineral royalties, mined land reclamation, and black lung taxes, a considerable portion of which return to Wyoming (Ackermann pers. comm.).

The County, Campbell County School District 1, and several special service districts also rely on ad valorem/property taxes levied on the real property and value of production and benefit from operations of the Buckskin Mine.

Rising production and market values for oil, natural gas, and coal, coupled with increases in production have given rise to dramatic increases in the ad valorem tax bases of producing counties, particularly Campbell County. In 2008, Campbell County had an ad valorem tax base of $4.72 billion, an increase of more than $1.0 billion, or 29% increase in the past three years. Campbell County's total ad valorem tax base accounted for more than 21% of the aggregate statewide assessed value on all real property and mineral production. The coal mining industry accounted for nearly 66% of Campbell County's total assessed value (table 3.17-1). The Buckskin Mine, along with other coal mines and the natural gas industry, are the largest taxpayers in Campbell County.

Table 3.17-1. Contribution of Coal Mining to 2008 Assessed Valuation of Campbell County

Total Assessed Value	Coal Mining (Real Property)	State-Assessed Minerals—Coal	Coal-Related Share of Total[a]
$ 4,772,822,444	$ 258,857,305	$ 2,852,086,593	65.8%

[a] (coal mining real property + state-assessed minerals) / total assessed value = coal-related share of total

Sources: Wyoming Department of Revenue 2008 and Wyoming State Board of Equalization 2008.

3.17.1.2. *Environmental Consequences*

Federal and state royalties, severance tax, and other revenues generated by leasing and mining coal depend on the eventual sale date and price of coal. This analysis assumes a conservative price estimate of $7.85 per ton of coal. It is approximately 25% below the statewide average price of $10.56 per ton for 2010 thru 2012 (reflecting both contracted and spot sales prices) used by Wyoming's Consensus Revenue Estimating Group to estimate the state's revenues from mineral severance and federal mineral royalty revenues over the next five years (Wyoming Consensus Revenue Estimating Group 2007, 2008). Royalty and severance tax revenues would increase above the amounts projected in this analysis should actual values be higher, and vice versa. Coal prices increased in 2005, generally in response to concerns over transporting and maintaining adequate stockpiles, but then declined in 2006. Prices trended upward in 2007 and the first half of 2008, topping $14.00 per ton for 8,800-Btu coal in April and again in November (U.S. Department of Energy 2008a).

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mine-related activities in the support area (241 acres) would have a moderate to substantial, beneficial, short-term impact on economic development and revenues to federal, state, and local coffers resulting from various royalty and tax payments, respectively. Activities in the remainder of the overlap area (474 acres) related to mining existing coal leases would have the same impact as in the proposed tract and support area.

This alternative is projected to generate $69.2–$87.3 million in federal revenues, $90.6–$108.8 million in state and local revenues (table 3.17-2), and potential bonus bids on the leased recoverable coal ranging from $0.30 to $0.97 cents per ton. The projected revenues are based on the total tons of recoverable coal, and, therefore, are not affected by future production rates.

Table 3.17-2. Projected Major Revenue Increases under the Proposed Action and Alternatives[a]

Item	Existing Buckskin Mine	Additional Under Alternative 1 (No Action)	Additional Under Proposed Action	Additional Under Alternative 2
State and Local Revenues	$563.6 million	0	$90.6–$108.8 million	$250.2–$300.4 million
Federal Revenues	$417.0 million	0	$69.2–$87.3 million	$191.0–$241.1 million
Mine Life	14 years	0	2 years	6 years
Additional Employees	0	0	0	0

[a] Includes severance taxes, federal mineral royalties, and payments to the AML and Black Lung Disability funds. Revenues assume an average sale price of $7.85 per ton for coal. State and local revenues include allowances for "in-lieu" amounts for AML, for sales and use taxes on direct purchases by the mine, and ad valorem/property taxes on real property and production, but not the sales and use taxes associated with the indirect and induced activity supported by the mine. The state revenues do not include any allowances for "recapture" revenues from Campbell County School District 1.

The overwhelming majority of the state and local revenues reported above would accrue to the state general fund, budget reserve, and Permanent Wyoming Mineral Trust Fund. Substantial revenue would also go to the Wyoming School Foundation Program and school construction programs. Due to statutorily established "caps" on distributions of federal royalty and severance tax revenues to local government, only a relatively small share of these revenues would go to Campbell County and the City of Gillette.

The Wyoming School Foundation Program is also likely to benefit from revenues generated by the "recapture" provisions of local ad valorem taxation. These provisions are triggered when local school districts collect revenue based on state-mandated property tax levies for education that exceed authorized expenditure levels under the state's funding equalization program. These provisions require such excess tax revenue to be forwarded to the state for use in funding operations in districts with relatively smaller property tax bases. Campbell County School District 1 is among the few districts in the state that is consistently subject to the "recapture" provisions.

No Action Alternative

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have the same impact as those described under the Proposed Action. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) and mine-related activities in the support area (926 acres) would have a moderate to substantial, beneficial, short-term impact on economic development and revenues to federal, state, and local coffers resulting from various royalty and tax payments, respectively. Activities in the remainder of the overlap

area (38 acres) related to mining existing coal leases would have the same impact as in the BLM study area and support area.

Alternative 2 would generate $191.0–$241.1 million in projected federal revenues, $250.2–$300.4 million in state and local revenues (table 3.17-2), and potential bonus bids on the leased recoverable coal ranging from $0.30 to $0.97 cents per ton. The projected revenues are based on the total tons of recoverable coal and hence are insensitive to future production rates.

Allocation of revenue would be the same as described for the Proposed Action.

3.17.2. Population

3.17.2.1. *Affected Environment*

Future residency patterns of the Buckskin Mine's employees would be expected to mirror that of the mine's current workforce. More than 80% of the current workforce resides in or near Gillette, with 12% living elsewhere in Wyoming, and 8% commuting from locations in South Dakota. Because of the proximity of the mine to Gillette, the company does not sponsor bus service for employees to and from the mine as do some of the other mines in the region. Rather, employees drive personal or company vehicles or participate in informal carpools.

The community of Gillette, the county seat, would most likely attract the majority of any new residents due to its current population levels and the availability of services, shopping amenities, and educational institutions.

Campbell County's population climbed from 33,698 in 2000 to an estimated 41,473 in July 2008, ranking it the third most populous of Wyoming's 23 counties (table 3.17-3). The increase represents 23% net growth since 2000, trailing only Sublette County (43%) in terms of population growth rates among Wyoming counties. However, Campbell County ranked first in terms of net absolute population growth with a net gain of 7,775 residents. Natrona County, where Casper, the state's largest city is located, registered the second-largest absolute change, gaining 6,596 residents between 2000 and 2008 (U.S. Census Bureau 2009).

Table 3.17-3. Population Change, 2000 to 2008

					Population Change from 2000 through 2008	
	2000	2006	2007	2008	Absolute	Percent
Campbell County	33,698	38,480	40,433	41,473	7,775	23.1
City of Gillette	19,646	23,264	25,031	N/A	5,385*	27.4

N/A = Not yet available

Source: U.S. Census Bureau (2008a, 2009).

Gillette's July 2007 population of 25,031, as reported by the U.S. Census Bureau, ranks it the fourth-largest city in the state, behind Cheyenne, Casper, and Laramie. Gillette's net population gain of 5,385 residents led all municipalities in the state by a considerable margin; Casper's net

gain of 3,359 residents was the second-largest increase among Wyoming cities and towns (U.S. Census Bureau 2008a).

The City of Gillette has long maintained that the Census Bureau population estimates are low. The city's population estimates were 27,533 and 30,636, respectively for December 2006 and 2007: the latter is more than 5,600 residents higher than the census estimates. The city cites updated housing inventories, household demographics, and the extremely low housing vacancy rates for its higher estimates (City of Gillette 2008a). Beyond the direct implications for population, the latter also suggests that the Census estimates overlook households that would qualify as residents but are unable to find housing and consequently are living in local hotels and motels on a longer-term basis (Langston pers. comm.). The city also believes the Census estimates overlook the many single-status workers who reside in the community on a long-term basis, but who maintain a permanent legal place of residence elsewhere.[6] Though they technically are not residents, these individuals place demands on the city and other local public service providers.

In comparison to the statewide population, the median age of Campbell County residents was substantially lower and it had relatively fewer minority residents, a higher percentage of residents under 18, and a larger average household size as shown in table 3.17-4.

Table 3.17-4. Demographic Characteristics, 2000

Characteristic	Wyoming	Campbell County
Median Age	36.2	32.2
Percent Residents < 18 Years Old	26.1	31.0
Average Household Size	2.5	2.7
Percent Minority Residents	7.9	3.9

Source: Task1C Report (BLM 2005b)

The majority of the current population directly and indirectly associated with the Buckskin Mine's current workforce resides in and is already integrated into the Gillette community.

3.17.2.2. *Environmental Consequences*

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mine-related activities in the support area (241 acres) would have no impact on the population in Campbell County, the City of Gillette, or nearby unincorporated areas. Activities in the remainder of the overlap area (474 acres) related to mining existing coal leases would have the same impact as in the proposed tract and support area.

[6] Single-status workers are married with spouses or families, or are unmarried but living in household settings, who relocate temporarily for employment purposes but who are not accompanied by other family or household members.

The proposed tract would allow the Buckskin Mine to maintain operations at the current level; the mine would not expand as a result of a lease sale. Consequently, no new employment opportunities would result directly from this action, and local and regional populations would not change to accommodate that need.

No Action Alternative

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have the same impact as those described under the Proposed Action. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) and mine-related activities in the support area (926 acres) would have no impact on the population in Campbell County, the City of Gillette, or nearby unincorporated areas. Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases would have the same impact as in the BLM study area and support area.

An alternative tract configuration would allow the Buckskin Mine to maintain operations at the current level; the mine would not expand as a result of a lease sale. Consequently, no new employment opportunities would result directly from this action and therefore local and regional populations would not change to accommodate that need.

3.17.3. Employment

3.17.3.1. *Affected Environment*

Coal mining processes and productivity have changed substantially in recent times. New technologies and higher-capacity equipment are major contributors to these changes. Local coal mining employment grew rapidly during the 1970s as more mines opened and production climbed. Between 1980 and 1998, overall production rose while the number of mining employees decreased or remained constant. The employment declines followed major capital investments in facilities and production equipment aimed at increasing productivity (BLM 2005d). Since 1998 direct employment in Powder River coal mines has climbed, but relatively slower than production, which has risen by more than 50% (Wyoming Department of Employment 2009a).

At the beginning of 2008, the mining sector, including oil and gas workers, accounted for more than 26% of all wage and salary jobs in Campbell and neighboring Converse counties, more than two-and-one-half times the statewide percentage. Surface coal mines or coal contractors in those two counties directly employed approximately 7,400 people, representing about 23% of the total

employment labor force (Wyoming Department of Employment 2009a, 2009b; U.S. Bureau of Labor Statistics 2009).

Total statewide covered employment[7] stood at 276,195 in the first quarter of 2008, nearly 20% higher than the corresponding 230,554 jobs in 2003. Approximately one-out-of-four new jobs added in the state during the five-year period was related to the energy industry, with most of that increase concentrated in support industries for oil and gas development.

During that same period, statewide coal mining employment increased by 1,809 jobs (27%) to 6,614, while total employment in Campbell County grew by 8,010 jobs (29%) (Wyoming Department of Employment 2009b). The recent increases in the numbers of local jobs has affected all industries, but was concentrated in mining, construction, transportation, and local government (Wyoming Department of Employment 2009b, 2009c). The mining sector, which includes the oil and gas industry, accounts for about 28% of all employment and 39% of the total labor wages paid in Campbell County. Coal mining is the major constituent of the mining industry in Campbell County, unlike most other areas of Wyoming where oil and gas development is the primary constituent.

Local labor market conditions reflect the strong economic expansion in recent years, driven principally by energy resource development. Unemployment has been near historic lows with average unemployment dipping below 2.0% in Campbell County in 2008, even as the local labor force has grown due to immigration and the attraction of additional residents into the labor force (U.S. Bureau of Labor Statistics 2009).

The Buckskin Mine provides work for 338 (October 2008) employees. The current employment level resulted from an increase of about 130 employees following the 2004 acquisition of additional reserves in the West Hay Creek coal lease and subsequent increase in production. The mine also purchased additional mining equipment to boost production as it worked to address increased stripping ratios (overburden to coal ratio) in its active production seams.

The Buckskin Mine is contemplating hiring a few additional employees to reach its currently desired staffing levels. Filling these positions, a part of the No Action Alternative, would raise the workforce to 345 or 350 workers (Ackermann pers. comm.). Little or no further change in direct employment is anticipated at the mine in conjunction with either the Proposed Action or Alternative 2, assuming a sustained average annual production of 25 million tons.

[7] Covered employment refers to those full- and part-time, private and government wage and salary workers covered under the state's unemployment insurance program. About 97% of non-agricultural workers are included. Exclusions include insurance and real estate agents on commission; most railroad workers; the self-employed; unpaid volunteers or family workers; members of the military; and many agricultural workers.

3.17.3.2. Environmental Consequences

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mine-related activities in the support area (241 acres) would have a negligible, beneficial, short-term impact by extending current employment levels by two years; no new jobs would be added. Activities in the remainder of the overlap area (474 acres) related to mining existing coal leases would have the same impact as in the proposed tract and support area.

No Action Alternative

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have a negligible, beneficial, short-term impact on local employment due to Buckskin's intention to hire a few additional employees to meet current staffing needs. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) and mine-related activities in the support area (926 acres) would have a minor, beneficial, short-term impact by extending current employment levels by up to six years; no new jobs would be added. Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases would have the same impact as in the BLM study area and support area.

3.17.4. Housing

3.17.4.1. Affected Environment

The 2000 census tallied 13,288 housing units in Campbell County (U.S. Census Bureau 2008b). Population growth since 2000 has prompted new housing construction in the region. According to the Census Bureau estimates, net additions to the number of housing units in Campbell County from 2000 through 2007 total 1,240 units (table 3.17-5). However, for many years construction did not keep pace with demand. Consequently, vacancy rates have fallen to record lows and housing prices have climbed. In the second half of 2007, a survey of rental housing estimated a vacancy rate of just 0.3% (4 units) in Campbell County (Wyoming Housing Database Partnership 2008). Another recent housing survey in Gillette yielded a vacancy rate of 0.1% for rental properties with many complexes reporting lengthy waiting lists. That survey also estimated a year-end vacancy rate of 2.0% among 11 mobile home parks (City of Gillette 2008a).

Table 3.17-5. Campbell County Housing Inventory, 2000 and 2007

2000	2007	Change
13,288	14,528	+1,240

Source: U.S. Census Bureau 2008b

In 2007, a major surge in new residential construction occurred in Campbell County, triggered by pent-up housing demand and anticipated future demands associated with the pending construction of the Dry Fork Station power plant (2008–2010), rising coal production, and continuing natural gas development. The City of Gillette alone issued 986 building permits for new housing units in 2007. That total, consisting of 244 single-family units, 140 duplex units, and 602 multi-family units, nearly equaled the combined total of the previous six years. In addition, the city issued 126 permits for new manufactured homes. At year's end 624 multifamily units were under construction with another 72 units expected to be permitted in early 2008 (City of Gillette 2008a).

In the fourth quarter of 2007, average rental housing costs in Campbell County were $708 for a two-bedroom, unfurnished apartment; $308 for a single-wide mobile home lot; and $1,185 for a two- or three-bedroom single-family home. As compared to the same period in 2006, those averages represent increases of 1.5%, 9.1%, and 21.6% for apartments, mobile home lots, and single family homes, respectively. Within the state, only Teton and Sublette counties have higher costs (Wyoming Department of Administration and Information 2008).

The average selling price of homes in Campbell County in 2006, based on 436 sales, was $199,945. That average was the fifth highest among Wyoming counties, a 7.6% increase over 2005, and an overall increase of 52% in five years (Wyoming Housing Database Partnership 2008).

In addition to permanent housing, a substantial number of temporary or transient housing exists in Campbell County, the City of Gillette, and nearby unincorporated areas. Such housing includes hotels or motels, campgrounds, and some spaces within recreational vehicle (RV)/mobile home parks. Given the tight housing market conditions in Gillette, workers and families waiting for traditional housing to become available are reportedly using some units for longer-term occupancy.

Gillette currently supports 18 motels and inns offering a total of about 1,370 guest rooms; Wright recently opened a 27-room motel (Wyoming Travel and Tourism 2007). Commercial construction permits for a new 80-room motel and a new dormitory to house railroad employees were also issued in 2007 (City of Gillette 2008a).

Gillette has two year-round, commercial campgrounds with approximately 135 hookups for RVs plus tent areas (Wyoming Travel and Tourism 2007). In an effort to address current and anticipated housing needs (particularly those associated with temporary workforces for power plant construction and oil and gas development) Campbell County amended its zoning regulations in 2007 to include a new district for recreational vehicle parks. Such parks can

accommodate travel trailers, campers, motor homes, and other recreational vehicles that are commonly used as housing, in a setting that offers centralized laundries, showers, and recreational support activities, as well as utility service and hookups (Campbell County 2008b).

3.17.4.2. *Environmental Consequences*

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mine-related activities in the support area (241 acres) would have no impact on housing demands in Campbell County, the City of Gillette, or nearby unincorporated areas.

The proposed Hay Creek II tract would allow the Buckskin Mine to maintain operations at the current level; the mine would not expand as a result of a lease sale. Consequently, no new employment opportunities or influxes of new residents would result directly from this action and, therefore, demands on local and regional housing resources would not change to accommodate that need.

No Action Alternative

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have the same impact on housing demands as those described under the Proposed Action. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) and mine-related activities in the support area (926 acres) would have no impact on housing demands in Campbell County, the City of Gillette, or nearby unincorporated areas. Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases would have the same impact as in the BLM study area and support area.

An alternative tract configuration would allow the Buckskin Mine to maintain operations at the current level; the mine would not expand as a result of a lease sale. Consequently, no new employment opportunities or influxes of new residents would result directly from this action and, therefore, demands on local and regional housing resources would not change to accommodate that need.

3.17.5. Local Government Facilities and Services

3.17.5.1. *Affected Environment*

The availability of revenues generated by mineral production has helped local government facilities and services address growing demands for public services. Current facilities and

services are generally adequate for the current population, although several service providers are engaged in expansion plans to accommodate future growth and improve service delivery.

Campbell County School District 1, the third-largest district in Wyoming in total enrollment, is the public school district most directly affected by operations at the Buckskin Mine. Total enrollment in Campbell County School District 1 declined by more than 500 students between 1998 and 2004, and climbed by 390 students through the fall of 2007 in response to economic and population growth in the county (Wyoming Department of Education 2008). The enrollment increase is marked by a disproportionate increase in the number of very young children, i.e., the total number of students enrolled in kindergarten through third grade accounting for more than 70% of the net increase. This pattern is indicative of the recent migration by younger households into the area.

Campbell County School District 1 facilities include 15 elementary schools, 2 junior high schools, and 2 high schools (one with two campuses in Gillette). The school district is in the midst of a five-year plan to replace several schools, modernize others, and complete other major systems maintenance and upgrades. The overall plan is budgeted at more than $57 million. Future plans include completion of a new elementary school and additions to a high school (Wyoming School Facilities Commission 2007).

The Campbell County Sheriff's Department and Gillette Police Department are the two primary local law enforcement agencies in the county. In addition to general law enforcement throughout the county, the Sheriff's staff provides court security, conducts criminal investigations, operates the detention center, and provides animal control and dispatch for multiple entities.

The Sheriff's office is budgeted for 60 sworn deputies and other employees. Campbell County is proceeding with a major expansion and remodel of the Campbell County detention center. The existing facility has 128 beds, with separate modules for women and juveniles (BLM 2005d). The expansion will add 144 beds for adult inmates along with a separate 16-bed facility for juvenile offenders. Additional space for detention center support functions and departmental administrative, dispatch, and records storage are also included in the expansion (Campbell County 2008a).

The Gillette Police Department has primary responsibility for law enforcement within the municipal boundaries. The department had 70 full-time positions in 2007, an increase of 10 positions as compared to 2005. In part, the increase reflects heightened demands for services associated with a rapid influx of energy-related workers and the corresponding population growth (City of Gillette 2008b).

Fire suppression, fire safety, first responder medical emergency, and hazardous material response throughout Campbell County is provided by the Campbell County Fire Department, which is governed by a city-county joint powers board. The department maintains four stations in Gillette and six rural stations dispersed throughout the county. Construction of a new departmental headquarters facility commenced in 2007. The facility includes administrative office space, training facilities, parking bays for apparatus, and maintenance and storage facilities

(City of Gillette 2008a). The Buckskin Mine maintains equipment and trained staff to fight fires on mine property.

The primary medical care facility serving the region is the Campbell County Memorial Hospital, a 90-bed acute care hospital, located in Gillette. The hospital is planning for a major expansion and renovation project that will add 73 new rooms, as well as other diagnostic, treatment, patient-care, and support facilities. Local health care capabilities include a nursing program at Gillette College, housed in a newly completed facility, built by the city. The new Health Science Center provides opportunities for expanded cooperative teaching and training between the college and the hospital.

Ambulance service for Campbell County is provided by the hospital, which has a 24-hour emergency service capability. The Campbell County Fire Department provides first responder service to emergency calls, but transport is the responsibility of the hospital-affiliated ambulance service. Emergency air transport service for severe injuries or critically ill patients is available through Wyoming Life Flight, based in Casper, Wyoming. Wyoming Life Flight provides transport to Wyoming Medical Center, a level 2 trauma facility, and other appropriate regional health care facilities in Billings, Montana, Denver, Colorado, or elsewhere.

The principal water and wastewater utilities are operated by the City of Gillette. The city's water system has ample capacity for its service area for most of the year. However, the system operates near capacity during the peak demand months of June, July, and August. The city recently completed a level II water study to identify longer-term solutions to its water supply problems and is now proceeding to implement its recommendations. High-priority actions include drilling a new well, promoting additional conservation through education and new rate structures, and adopting outside watering/irrigation schedules during the summer (Petersen pers. comm.; City of Gillette 2008a).

Gillette's sewer treatment system was originally designed for a service population of approximately 35,000. Recently completed improvements increased treatment capacity to accommodate a population of 50,000. The city is also proceeding with plans to expand/extend major sewer lines to provide capacity to accommodate new development. Currently, the system serves in excess of 30,000 residents and visitors in the city and surrounding areas (City of Gillette 2008a).

3.17.5.2. *Environmental Consequences*

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mine-related activities in the support area (241 acres) would have a negligible, short-term impact on local government facilities and services by extending current demands by two years; no new impacts would occur. Activities in the remainder of the overlap area (474 acres) related to mining existing coal leases would have the same impact as in the proposed tract and support area.

Although no further changes in direct employment or populations are expected to occur in association with the proposed tract, the timeline of existing and previously planned new positions and the resulting demands on local government facilities and services would be extended under the Proposed Action.

No Action Alternative

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have no impact on local government facilities and services because the No Action Alternative would not extend the timeline of current demands. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) and mine-related activities in the support area (926 acres) would have a negligible, short-term impact on local government facilities and services by extending current demands by up to six years; no new impacts would occur. Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases would have the same impact as in the BLM study area and support area.

Although no further changes in direct employment or populations are expected to occur in association with an alternative tract configuration, the timeline of existing and previously planned new positions and the resulting demands on local government facilities and services would be extended under Alternative 2.

3.17.6. Social Setting

3.17.6.1. *Affected Environment*

The social setting for coal development in the PRB is described in the Task 1C Report for the PRB coal review (BLM 2005d)[8]. That report emphasizes Campbell County and its communities as the nucleus for coal development in the PRB. The Buckskin Mine has been in production since 1981, and the mine and its employees contribute to the social and economic stability of Campbell County and the City of Gillette.

3.17.6.2. *Environmental Consequences*

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mine-related activities in the support area (241 acres) would have a negligible, beneficial, short-term impact by extending the current social setting of Campbell County and local communities by two years. Activities in the remainder of the overlap area (474 acres) related to

[8] This report is available online at http://www.blm.gov/wy/st/en/programs/energy/Coal_Resources/PRB_Coal/prbdocs.html.

mining existing coal leases would have the same impact as in the proposed tract and support area.

No Action Alternative

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have no impact on the local social setting. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) and mine-related activities in the support area (926 acres) would have a minor, beneficial, short-term impact by extending the current social setting of Campbell County and local communities by up to six years. Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases would have the same impact as in the BLM study area and support area.

3.17.7. Environmental Justice

Environmental justice is concerned with actions that have disproportionate impacts on a given segment of society as a result of physical location, perception, design, noise, or other factors. On February 11, 1994, Executive Order 12898, "Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations," was published at 59 FR 7629. That executive order requires federal agencies to identify and address unreasonably high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations (defined as those living below the poverty level). The executive order makes it clear that its provisions apply fully to Native American populations and Native American tribes.

Communities within Campbell County, entities with interests in the area, and individuals with ties to the area may have concerns about the presence of surface coal mines in the area. Environmental justice concerns are usually directly associated with impacts on the natural and physical environment, but these impacts are likely to be interrelated with social and economic impacts as well. Native American access to cultural and religious sites may fall under the umbrella of environmental justice concerns if the sites are on tribal lands or access to a specific location has been granted by treaty right.

Compliance with Executive Order 12898 concerning environmental justice was accomplished through opportunities for the public to receive information on this EIS in conjunction with consultation and coordination described in section 1.6. This EIS and contributing socioeconomic analysis provide a consideration of the impacts with regard to disproportionately high and adverse impacts on minority and/or low-income groups, including Native Americans.

3.17.7.1. Affected Environment

Economic and demographic data (U.S. Census Bureau 2000, 2006a) indicate that neither minority populations nor people living at or below the poverty level make up a "meaningfully greater increment" of the total population in Gillette or Campbell County than they do in the state as a whole. Also, the Native American population is smaller than in the state as a whole, and no known Native American sacred sites are located on or near the general analysis area (section 3.12.2.1).

3.17.7.2. Environmental Consequences

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mine-related activities in the support area (241 acres) would have no impact on environmental justice. Activities in the remainder of the overlap area (474 acres) related to mining existing coal leases would have the same impact as in the proposed tract and support area.

Because neither minority populations nor people living at or below the poverty level make up a "meaningfully greater increment" of the total population in Gillette or Campbell County than they do in the state as a whole, the Proposed Action would not result in adverse effects associated with environmental justice.

No Action Alternative

Under the No Action Alternative, the coal lease application would be rejected and no new federal coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have the same impact as those described under the Proposed Action. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, mining in the BLM study area (up to 1,883 acres) and mine-related activities in the support area (926 acres) would have no impact on environmental justice. Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases would have the same impact as in the BLM study area and support area.

Because neither minority populations nor people living at or below the poverty level make up a "meaningfully greater increment" of the total population in Gillette or Campbell County than they do in the state as a whole, Alternative 2 would not result in adverse effects associated with environmental justice.

3.17.8. Regulatory Compliance, Mitigation, and Monitoring

Surface coal mines are required to pay royalty and other taxes and fees as required by federal, state, and local regulations. The BLM compares the amount of coal reported as produced with the estimated amount of coal in the ground to verify that royalties are paid on all of the coal that is mined.

3.17.9. Residual Effects

3.17.9.1. *Human Health Impact Assessment*

In 2008, public concerns were brought to the BLM's attention in regard to conducting human health impact assessments in the PRB where coal mining activities occur. These public concerns included emissions from coal mining activities, such as particulate matter and NO_x exposure, and their potential impact on the health of people living in the local area.

Health impact assessments examine and assess the potential effects of proposed projects on human health on a broad scale, including social, emotional, and cultural, and physical impacts. These assessments rely on available scientific data, public testimony, and modeling to predict potential health impacts. The BLM does not have jurisdiction in regard to conducting human health assessments. However, the BLM invited the Wyoming Department of Health/Environmental Health Section and the U.S. Center for Disease Control and Prevention to review and provide comment on the draft EIS for the Hay Creek II Coal Lease Application.

In reference to the stated public concerns, air pollution is controlled by state and federal air quality regulations and standards established under the federal CAA Amendments. State implementation plans are in place to ensure proposed actions such as coal mining comply with all associated air quality regulations and criteria. The WAAQS are stricter than the NAAQS and are enforced by the WDEQ.

As described in section 3.4.2.3, the WDEQ in a joint effort with PRB mining stakeholders developed a detailed NEAP for the coal mines of Campbell and Converse counties, Wyoming, based on EPA natural event policy guidance. It identifies potential control measures for protecting public health and minimizing exceedances of the PM_{10} NAAQS.

All mines are required to conduct long-term air quality modeling to show that their proposed operations will comply with the NAAQS and WAAQS. They are also required to conduct regular monitoring to demonstrate that their actual air emissions do not exceed these standards. The WDEQ permit process for coal mines requires air quality modeling of the primary air pollutants PM_{10} and NO_2. Section 3.4.2.3 contains air quality mitigation measures that WDEQ implemented to prevent exceedances of NAAQS and WAAQS by surface coal mines.

3.18. The Relationship Between Local Short-Term Uses of the Human Environment and the Maintenance and Enhancement of Long-Term Productivity

Under NEPA, an EIS must include a discussion of the "relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). This requirement is duplicated in the BLM NEPA Handbook chapter V, sections B.2.a.(3) and C.3.h.(2) (BLM 2008b). This section provides a summary of the residual impacts of surface coal mining (short-term use) on those resources that have some long-term production capability. Resources such as geology, paleontology, surface water, wildlife use, and others considered "non-producing" are not included in this section.

3.18.1. Local Area

3.18.1.1. *Topography*

If either action alternative is implemented, coal mining activities would modify almost all components of the present ecological system in the mined tract, which have developed over a long period. In the long term, the land surface would be topographically lower following reclamation. Although the reclaimed surface would resemble original contours, it would have a more homogenous appearance and lack some of its original diversity in shape, structure, and outline.

3.18.1.2. *Coal Bed Natural Gas*

CBNG is currently being recovered from within the general analysis area, and the BLM's overall assessment of this resource suggests that a large portion of the CBNG resource in the area has been recovered or would be recovered prior to mining under either of the action alternatives. CBNG resources that have not been recovered from the Canyon and Anderson seams prior to mining would be lost when the coal is removed. Luca Technologies Inc. has developed a method of using methanogenisis to enhance biogenetic methane production from indigenous bacterial communities residing in the PRB coals. This technique is currently capable of producing up to 30 million cubic feet per day through nutrient enhancement of microbacterial communities; the bacteria metabolize the complex organic molecules in hydrocarbon deposits and produce the gas as a waste product.

Selection of the No Action Alternative (Alternative 1) would not be likely to decrease the total methane emissions attributable to coal mining in the United States in the long term, because numerous other sources of coal exist that could meet the demand even after the Buckskin Mine recovered all of the coal in its existing leases. Likewise, it would not be likely that total U.S. methane emissions would increase measurably in the long term if one of the action alternatives is implemented, because the annual production rate would not increase under either alternative.

3.18.1.3. Air Quality and Visual Resources

Because annual coal production rates and supporting mining activities would continue at current levels under either action alternative, they would not increase existing impacts on the air quality and visual resources in the area on a short-term basis. However, existing effects would continue for two to six years beyond the current life-of-mine estimate. No residual impacts on air quality or visibility are expected following coal extraction, removal of surface facilities, and completion of reclamation.

3.18.1.4. Water Resources

If either of the action alternatives is implemented, groundwater quality after reclamation may differ from premining conditions, but would be similar to the quality in previously reclaimed areas. Water quality would remain adequate for current uses such as livestock and wildlife. Mining would permanently remove any aquifers in the final tract configuration. Groundwater depth would increase in an area extending northwest (upstream) of mining operations due to drawdown from dewatering prior to mining, but should eventually return to premining levels because recharge areas would not be disturbed during coal recovery.

3.18.1.5. Vegetation

The forage and associated livestock grazing present in the general analysis area would be temporarily and incrementally disturbed during mining and reclamation. Croplands and pasture in the area would also be affected. Impacts on native vegetation and producing agricultural lands could occur on up to 2,847 acres due to mining and support activities (e.g., topsoil stripping, soil stockpiling), if the largest possible tract configuration is mined. However, because the county roads in the area are not likely to be closed or relocated, actual new disturbance is expected to be limited to a maximum of 618 additional acres (table 2-4). Any disturbance would occur incrementally over a period of years. Soils would be replaced and vegetation would be restored, as required by the mining plan (section 3.8 and section 3.9). Because the general analysis area is dominated (71% combined) by upland grassland communities and agricultural lands, the establishment of reclaimed grassland communities after mining has been completed would represent similar or somewhat improved habitats, respectively, compared to premining conditions. In the long term, reclaimed lands would provide equivalent or better forage production capacity for domestic livestock. This outcome would be required before the performance bond is released. Long-term productivity would depend primarily on postmining range management practices largely controlled by private landowners.

3.18.1.6. Wildlife and Wildlife Habitat

If either of the action alternatives is implemented, mining would disturb foraging habitat for a variety of wildlife species, particularly those associated with upland grasslands (the combined dominant habitat in the area). Sagebrush obligates such as the sage-grouse would not experience the same level of impacts due to the limited presence (approximately 11%) and broken distribution of shrubs in the general analysis area. Although some wildlife would be displaced or

lost in the short term, monitoring of previously reclaimed lands indicates that reclamation can support levels of wildlife abundance and species richness similar to those present prior to mining disturbance over the long term. The timeline for the return to premine wildlife use varies widely by species, with the shortest period for grassland species and longest for species that depend on mature sagebrush, such as the sage-grouse and pronghorn.

3.18.1.7. *Recreational Resources*

If either of the action alternatives is implemented, short-term impacts on recreational resources could occur from a reduction in big game populations resulting from habitat disturbance and reduction in access to some hunting areas. However, hunting opportunities are already limited due to the dominance of private lands in and around the general analysis area, so these impacts would be minimal. Reclamation efforts would eventually restore wildlife habitats similar to premining conditions, and access to hunting areas affected by mining would presumably be restored as well. Consequently, no long-term adverse impacts on recreation would be expected.

3.18.1.8. *Socioeconomic Resources*

If either of the action alternatives is implemented, the short- and long-term economy of the region would be enhanced. The Proposed Action would extend the current life-of-mine estimate by two years; Alternative 2 would extend it up to six years (table 2-4).

3.18.2. Human Health Impact Assessment

In 2008, public concerns were brought to the BLM's attention in regard to conducting human health impact assessments in the PRB where coal mining activities occur to assess the potential impacts of proposed projects on human health. These assessments examine health on a broad scale, including social, emotional, and cultural impacts as well as physical impacts. The impact assessments rely on available scientific data, public testimony, and modeling.

The BLM does not have jurisdiction in regard to conducting specific human health assessments. However, that agency invited the Wyoming Department of Health/Environmental Health Section and the U.S. Center for Disease Control and Prevention to review and provide comment on the Hay Creek II Coal Lease Application EIS. Neither agency was able to provide detailed information due to time and staffing constraints. Information regarding general aspects of human health impact assessments are included in sections 3.4 (Air Quality), 3.5 (Water Resources), 3.14 (Noise), 3.16 (Hazardous and Solid Waste), and 3.17 (Socioeconomics). While this information may not provide a thorough discussion of all aspects of these assessments, it is a summary of credible scientific data and evidence that is relevant to evaluating reasonably foreseeable t impacts on human health.

Public concerns were largely focused on the potential for exposure to particulate matter and NO_x emissions from coal mining, and the potential impacts of such exposures on the health of people living in the vicinity of surface coal mines located in the eastern PRB.

Air pollution is controlled by state and federal air quality regulations and standards established under the federal CAA Amendments. State implementation plans are in place to ensure proposed actions like coal mining comply with all associated air quality regulations and criteria. Wyoming standards, WAAQS are stricter than their national counterparts, NAAQS, and are enforced by the WDEQ. As described in section 3.4.2.3, the WDEQ developed a NEAP for the coal mines of the PRB. The plan, based on the EPA Natural Event Policy guidance, identifies potential control measures for protecting public health and minimizing exceedances of the PM_{10} NAAQS, which is the only particulate emission required to be monitored at this time.

All mines are required to conduct air quality modeling to show that their proposed operations will comply with the WAAQS and NAAQS, and they are required to demonstrate through monitoring that their actual air emissions do not exceed the standards. The WDEQ coal mining permit process requires air quality modeling of the primary air pollutants PM_{10} and NO_2. Section 3.4.2.3 addresses air quality mitigation measures that the WDEQ has implemented to prevent exceedances of the WAAQS and NAAQS at other PRB surface coal mines.

As stated above and as discussed in section 3.4, maintenance of current annual coal production rates and supporting mining activities under either action alternative would mean that ongoing, short-term impacts on air quality would not increase. No residual impacts on air quality are expected following coal extraction, removal of surface facilities, and completion of reclamation.

According to section 3.5.1, postmining groundwater quality may differ from premining quality, but is expected to be quite similar to the premining overburden aquifer and meet Wyoming Class III standards for use as stock water.

While mining is in progress, surface water quality (section 3.5.2) would continue to be protected by directing surface runoff from affected areas to various sediment-control structures including sediment ponds, traps, ditches, sumps, and mine pits. Under normal conditions, exceedances of effluent limitations are not expected in the future as mining extends into new drainages and additional sediment-control facilities are added. After mining and reclamation are complete, surface water flow and quality would approximate premining conditions.

Noise levels in the general analysis area would not increase near most occupied residences in the vicinity; however, existing activities such as blasting, loading, and hauling would continue for two years beyond the current life-of-mine estimate under the Proposed Action, and up to six years under Alternative 2. Projected noise in the general analysis area would be farther from some homes than currently allowed within the existing permit area. The distance and terrain between occupied homes and disturbance area provide visual and audio barriers to the north and west of the general analysis area. Due to the general remoteness of the area, and because mining is already occurring there, noise would have few off-site impacts. No residual noise impacts are expected.

As discussed in section 3.16, wastes generated by mining in the general analysis area would be handled in accordance with the existing regulations using the procedures currently in use and in

accordance with the WDEQ-approved waste disposal plan at the Buckskin Mine. No residual hazardous and solid waste impacts are expected.

As discussed in section 3.17.6, no change in the social setting of Campbell County or the community of Gillette would be anticipated under either action alternative. The Buckskin Mine has been operating for more than 27 years, and the mine and its employees contribute to the social and economic stability of Campbell County and the City of Gillette. No socioeconomic residual impacts are expected.

Coal mines, including the Buckskin Mine, are under the jurisdiction of the Mine Safety and Health Administration. That agency's mission is to "administer the provisions of the Federal Mine Safety and Health Act of 1977 (Mine Act), as amended by the Mine Improvement and New Emergency Response Act of 2006 (MINER Act), and to enforce compliance with mandatory safety and health standards as a means to eliminate fatal accidents; to reduce the frequency and severity of nonfatal accidents; to minimize health hazards; and to promote improved safety and health conditions in the Nation's mines" (U.S. Department of Labor 2009). While an official health impact assessment is not within the agency's authorization, it does monitor and enforce some of the health and safety standards for mining that are related to these impact assessment issues.

3.18.3. Greenhouse Gas Emissions

Considerable scientific investigations and discussions are ongoing regarding the causes of the recent rise in global mean temperatures and whether a warming trend will continue. This section addresses GHG emissions as specifically related to the Buckskin Mine and the Hay Creek II LBA tract.

GHGs have been raised as a concern due to the greenhouse effect. Ongoing scientific research has identified the potential impacts of anthropogenic (from human activities) GHG emissions and changes in biologic carbon sequestration on the global climate. Through complex interactions on a regional and global scale, these changes cause a net warming effect of the atmosphere, primarily by decreasing the amount of heat radiated by the earth back into space, much as glass traps heat over a greenhouse. Many GHGs occur naturally in the atmosphere, such as CO_2, methane (including CBNG), water vapor, ozone, and N_2O. Other GHGs are synthetic, such as chlorofluorocarbons, hydrofluorocarbons and perfluorocarbons, as well as sulfur hexafluoride.

Although natural GHG levels have varied for millennia, recent industrialization and burning of fossil carbon sources have caused equivalent CO_2 concentrations to increase dramatically, and are likely to contribute to overall global climatic changes. GHGs are not regulated, but a consensus has become established in the international community that global climate change is occurring and that GHGs may play a role. As with any field of scientific study, uncertainties are associated with the science of climate change. This does not imply that scientists do not have confidence in many aspects of climate change science. Some aspects of the science are known

with virtual certainty, because they are based on well-known physical laws and documented trends (EPA 2008b).

Climatic change analyses are comprised of several factors, including GHG emissions, land use management practices, and the albedo effect (i.e., the cycle of increased temperature of the environment resulting from increased absorption of normally reflected light). It is assumed that existing land and resource conditions in the general analysis area have been and will continue to be affected by climate change under all alternatives. National and regional data that are available have been referenced, including a recent comprehensive report, *The Effects of Climate Change on Agriculture, Land Resources, Water Resources and Biodiversity in the United States* (U.S. Climate Change Science Program 2008a).

Because the tools necessary to quantify incremental climatic changes associated with these GHG emissions are presently unavailable, the analysis cannot reach conclusions as to the magnitude or significance of the emissions on climate change, or to associate specific actions with the specific climate impacts. The impacts of climate change represent the cumulative impacts of, among other factors, all worldwide GHG and emissions and land use management practices.

As discussed in section 1.3, the BLM does not authorize mining just by issuing a federal coal lease. The WDEQ, with oversight from the OSM, has regulatory authority in issuing permits to mine coal in Wyoming. However, the BLM considers the impacts of mining coal in this EIS because it is a logical consequence of issuing a maintenance lease to an existing coal mine.

The use of the coal after it is mined is not determined at the time of leasing. However, almost all coal that is being mined in the Wyoming PRB is used to generate electricity by coal-fired power plants in many states. A discussion of emissions and byproducts generated by burning coal to produce electricity is included in section 4.2.14, with a more complete discussion of the status of global climate change and cumulative considerations in section 4.2.14.1. Chapter 4 also includes an assessment of cumulative impacts related to GHG emissions under all analyzed alternatives.

As discussed in section 2.2.2, under the currently approved mining plan, which represents the No Action Alternative, Kiewit anticipates that Buckskin Mine would mine its remaining estimated 370.4 million tons of recoverable federal coal reserves in 14 years at an average annual production rate of approximately 25 million tons. Kiewit estimates that the average annual coal production rate of approximately 25 million tons would continue under either action alternative.

To the extent that emission data were available or could be inferred from representative data, potential GHG emissions have been identified that could result from implementation of either of the action alternatives, as well as emissions that would result from the No Action Alternative. The analysis provides a qualitative measure of the incremental change in GHG emissions resulting from the action and no action alternatives. The analysis also provides a measure of the incremental change resulting from these alternatives in relation to GHG emissions from all current coal mining.

This study projects emissions for a typical year of operations at the Buckskin Mine, if additional federal coal reserves are leased and mined in the general analysis area. Emissions are measured

as metric tons of equivalent CO_2 (CO_2e), a unit of measure that takes into account the global warming potential of each of the emitted GHGs in terms of CO_2e emissions[9]. Table 3.18-1 summarizes the equivalent conversion factors used by the IPCC for those GHGs commonly associated with surface coal mining. The completed inventory includes emissions from carbon fuels used in mining operations and locomotive fuel used in on-site rail transport, electricity used on site (e.g., facility lighting and operation, lighting to illuminate roads, power for electrically operated equipment, and conveyors), and mining processes (e.g., blasting, methane released from mined coal, and spontaneous combustion). Net carbon sink effects from disturbed and reclaimed lands are considered negligible, as the projected annual stripping and reclamation acreages are roughly equal at 200 acres a year. Not included in this CO_2e emissions estimate is rail transport to the buyers.

Table 3.18-1. Carbon Dioxide Equivalent Conversion Factors

Greenhouse Gas	Conversion Factor
Carbon dioxide (CO_2)	1
Methane (CH_4)	21
Nitrous Oxide (N_2O)	310

Source: EPA 2005c.

The annual CO_2e emissions from the Buckskin Mine are not expected to increase under either action alternative for the Hay Creek II LBA; average annual production would not increase and average strip ratios and haul distances would remain substantially the same as under existing operations. Table 3.18-2 summarizes the annual Buckskin Mine CO_2e emissions inventory for nominal and maximum permitted production rates.

Table 3.18-2. Estimated Annual Equivalent Carbon Dioxide Emissions at the Buckskin Mine

Source	2008 Actual (25 million tons)	At 30 million metric tons per year	At 42 million metric tons per year
Fuel	94,136	107,379	150,331
Electricity	43,212	49,291	69,007
Mining Process	85,188	97,173	136,042
Total of three sources	**222,536**	**253,843**	**355,380**

Source: IML Air Quality Data Report 2010, available for viewing at the BLM Wyoming High Plains District Office in Casper, Wyoming.

Conversely, projected CO_2e emissions over the life of the mine would increase under either action alternative. Although annual average production rates and associated annual emission levels are not expected to increase.

[9] The EPA states, "Emissions of greenhouse gases are typically expressed in a common metric, so that their impacts can be directly compared, as some gases are more potent (have a higher global warming potential or GWP) than others. The international standard practice is to express greenhouse gases in carbon dioxide (CO_2) equivalents, or CO_2e. Emissions of gases other than CO_2 are translated into CO_2e using global warming potentials. The Intergovernmental Panel on Climate Change (IPCC) recommends using 100 year potentials" (EPA 2005c).

The Center for Climate Strategies estimates that activities in Wyoming will account for approximately 60.3 million metric tons of gross CO_2e emissions in 2010 and 69.4 million metric tons in 2020 (Center for Climate Strategies 2007). Using those projections, the 2008 Buckskin Mine emissions total (table 3.18-2) represents 0.37% of the 2010 statewide emissions.

As mentioned above, the CO_2e emission estimates in table 3.18-2 include projected methane emissions vented from exposed unmined coal. The estimated annual amount of CO_2e emissions from vented methane is approximately 79,156 metric tons, or about 36% of the total Buckskin Mine CO_2e emissions for 2008. Methane emissions from Wyoming's coal mines in 2010 are projected to be 2.3 million metric tons of CO_2e (Center for Climate Strategies 2007), of which the Buckskin Mine's 2008 methane emissions represent 3.4%. Methane emissions from U.S. anthropogenic sources in 2007 totaled 699.9 million metric tons CO_2e (U.S. Department of Energy 2008b). Therefore, the estimated 2008 methane emissions vented from recovered coal at the Buckskin Mine constitutes about 0.0113% of the total 2007 U.S. methane emissions from anthropogenic sources.

For computation of methane release from the coal seams at the Buckskin Mine, an emission factor of 7.44 standard cubic feet of methane per ton of coal mined (scf/ton) was used. The EPA guidance for surface mines in the northern plains recommends a regional average of 7.44 scf/ton for mining and processing coal in that region (EPA 2004). Methane adsorption[10] levels in PRB coal seams vary widely within and between seams. They depend on bed depth, geology, and CBNG extraction history and proximity to surface coal mines. Data obtained by the USGS and BLM Resource Management Group (U.S. Geological Survey 2006) from coal cores that the agencies collected near PRB mines show gas contents ranging from 0.48 scf/ton to 17.2 scf/ton. Since considerable CBNG production has occurred in the immediate vicinity of the Buckskin Mine, methane contents in the coal seams are expected to be at the lower end of this range. Related to this same study, an internal report gives an average gas content of 6.8 scf/ton, a median of 4.8 scf/ton, and a mode of 2.0 scf/ton (WSO-RMG 2006) for cores taken near the eastern margin of the PRB near the coal mines. Since the EPA factor of 7.44 scf/ton is slightly higher than the highest of these three measures, it was chosen to estimate the maximum rate of methane release from coal seams at the Buckskin Mine.

Under the No Action Alternative, the remaining life of the Buckskin Mine would be approximately 10 to 16 years, depending on production levels. Under the Proposed Action the mine life would be extended by approximately two years; Alternative 2 could extend the mine life by up to six additional years. The Buckskin Mine estimates that average annual production rates of 25 million tons would not be affected by any leasing alternative.

Section 4.2.14 presents an assessment of cumulative impacts related to GHGs, including potential contributions under the Proposed Action and alternatives.

[10] Adsorption is the adhesion of a thin layer of molecules of some substance to the surface of a solid or liquid.

3.18.4. Carbon Sequestration

Information relative to the carbon sequestration legislation was collected from news coverage posted on the internet and websites for the Wyoming Legislative Services Office, U.S. Department of Energy (DOE), and EPA.

Carbon sequestration, the process of carbon capture, separation, and storage or reuse, is being researched as a means to stabilize and reduce concentrations of CO_2 (a GHG). Direct options for carbon sequestration would involve means to capture CO_2 at the source (e.g., power plant) before it enters the atmosphere coupled with "value-added" sequestration (e.g., use of captured CO_2 in enhanced oil recovery operations). Indirect sequestration would involve means of integrating fossil fuel production and use with terrestrial sequestration and enhanced ocean storage of carbon (U.S. Department of Energy 2007a).

The PRB has geologic formations and producing oil and gas reservoirs that are potential target candidates for both enhanced oil recovery and/or deep geologic sequestration. The current limiting factor is the lack of pipeline infrastructure and economic feasibility for CO_2 transmission and use.

Although one enhanced oil recovery project involving CO_2 injection is underway in the PRB (Salt Creek Field) and another is possibly planned (Highlight Field), no geologic carbon sequestration projects currently exist or are currently planned in the PRB at this time. This may change with the advent of new federal legislation, regulations, and economic incentives, particularly those that may combine enhanced oil recovery and sequestration projects or operations.

Additionally, the EPA, from the perspective of considering CO_2 as a waste, is proposing new federal requirements under the Safe Drinking Water Act for the underground injection of CO_2 for the purpose of long-term underground storage, or geologic sequestration. The regulation is being proposed to ensure protection of underground sources of drinking water from injection-related activities. It is currently expected that the final rulemaking will be completed by 2010. This new rulemaking may result in increased interest in using existing, depleted, deep, oil and gas reservoirs, deep saline formations and/or deep coal seams such as found in the PRB.

3.18.5. Regulatory Compliance, Mitigation, and Monitoring

In 2009, the EPA issued the Mandatory Reporting of Greenhouse Gases Rule (74 FR 209), which requires reporting of GHG emissions from large sources and suppliers in the U.S. Under the rule, suppliers of fossil fuels or industrial GHGs, manufacturers of vehicles and engines, and facilities that emit 25,000 metric tons or more per year of GHG emissions are required to submit annual reports to the EPA. The rule was signed by the Administrator on September 22, 2009, and it became effective on December 29, 2009. The EPA believes that the new reporting system will provide a better understanding of where GHGs are coming from and will guide development of the best possible policies and programs to reduce emissions.

The PRB mines supply fossil fuel, but fall into the category of "Suppliers of Coal." The EPA did not finalize reporting requirements for coal suppliers in the Final Rule, Subpart KK (74 FR 209); however the agency anticipates making these requirements known by January 1, 2011, so that record keeping can begin and the first annual GHG emission reports can be submitted in 2012 (EPA 2010). Each of the PRB mines also generates more than 25,000 metric tons of GHG emissions, potentially qualifying for GHG reporting under this new criterion. The EPA has currently limited the applicability of the 25,000-metric ton threshold to stationary combustion sources (EPA 2010). The Buckskin Mine, with or without the Hay Creek II LBA, does not approach this stationary source threshold. Therefore, it is anticipated that formal GHG reporting for Buckskin will commence in January 2011.

Control of GHG emissions also is not currently required as part of the permitting process for the PRB coal mines. However, the mitigation and management of GHG emissions at the Buckskin Mine are being achieved through the following measures:

- minimizing blast size to the extent possible to reduce CO_2 and NO_2 emissions;
- using different blends of ammonium nitrate fuel oil and slurries and gels used in coal and overburden blasts to reduce CO_2 and NO_2 emissions;
- reducing fuel consumption by restricting equipment idling times, maintaining equipment (e.g., vehicles, compressors, generators) to improve fuel efficiency, and focusing on high-efficiency engines for replacement, thereby reducing CO_2, NO_2, and N_2O emissions; and
- suppressing in-pit coal fires promptly, thereby reducing CO_2 and NO_2 emissions from coal combustion.

3.19. Irreversible and Irretrievable Commitments of Resources

Under the Proposed Action and Alternative 2, the major commitment of resources would be mining and consumption of approximately 54.1 million tons and up to 149.7 million tons of coal, respectively; nearly all of that coal will be used for electrical power generation. CBNG that is not recovered prior to mining would be irreversibly and irretrievably lost (see additional discussion of the impacts of venting CBNG to the atmosphere in section 3.18 and in chapter 4). An estimated 1 to 2% of the energy produced would be required to mine the coal; this energy would also be irretrievably lost.

Under the Proposed Action and Alternative 2, the quality and characteristics of topsoil would be irreversibly changed on 419 acres (plus a buffer area to the north of the tract) and up to 1,883 acres (plus a 0.25-mile-wide buffer), respectively, as a result of mining and mine support activities (e.g., topsoil stripping, soil stockpiling). Actual impacts would likely be limited to 618 acres, under Alternative 2, because Kiewit does not anticipate pursuing closure or relocation of county roads necessary to mine additional reserves. Soil formation processes would continue

but would be irreversibly altered during mining and related activities. Newly formed soil material would be unlike that in the natural landscape.

Wildlife deaths resulting directly or indirectly from mining operations or associated activity would constitute irreversible and irretrievable losses, though future recruitment into the population would mitigate those losses to some degree.

Loss of human life could occur as a result of mining operations and vehicular and train traffic. On the basis of surface coal mine accident rates in Wyoming, as determined by the Mine Safety and Health Administration (1997) for the 10-year period from 1987 through 1996, fatal accidents of personnel directly employed at surface coal mines excluding contractors) occur at the rate of 0.003 per 200,000 human-hours worked. Disabling (lost-time) injuries occur at the rate of 1.46 per 200,000 human-hours worked. Any injury or loss of life resulting from mining and related activities would constitute irreversible and irretrievable losses.

Disturbance of all known historic and prehistoric sites in the mined area would be mitigated to the maximum extent possible. However, accidental destruction of presently unknown archeological or paleontological resources, including Native American resources, would constitute irreversible and irretrievable losses.

4.0 CUMULATIVE ANALYSES

Chapter 4 summarizes existing conditions and cumulative impacts in the PRB[1], as well as projected changes to those cumulative impacts that could result from adding future developments in the area. Cumulative impacts result from the incremental impacts of an action added to other past, present, and reasonably foreseeable future actions, regardless of who is responsible for such actions. Cumulative impacts can result from individually minor, but collectively significant, actions occurring over time.

The table (table 4-41) presented at the end of this chapter provides a summary of the magnitude and duration of cumulative impacts in the PRB based on upper and lower estimates for future coal production in the region, as described in the following discussion. The Proposed Action and alternatives for the Hay Creek II EIS fall within those projections.

The BLM completed three regional EISs evaluating the potential cumulative impacts of surface coal development in the 1970s and early 1980s (BLM 1974, 1979, and 1981). A draft document for a fourth regional EIS was prepared and released in 1984 (BLM 1984). Since those regional EISs were prepared, BLM has prepared a number of NEPA analyses evaluating coal leasing actions and oil and gas development in the PRB. Each of these NEPA analyses includes an analysis of cumulative impacts in the Wyoming PRB.

The BLM is currently completing the final phases of a regional technical study, called the PRB Coal Review, to help evaluate the cumulative impacts of coal and other mineral development in the PRB. The PRB Coal Review consists of three tasks:

- Task 1 identifies existing resource conditions in the PRB for the baseline year (2003) and, for applicable resources, updates the BLM's 1996 status check for coal development in the PRB.
- Task 2 defines the past and present development activities in the PRB and their associated development levels as of 2003 and develops a forecast of reasonably foreseeable development in the PRB through 2020. The reasonably foreseeable activities fall into three broad categories: coal development (coal mine and coal-related), oil and gas development (conventional oil and gas, CBNG, and major transportation pipelines), and other development, which includes development that is not energy-related as well as other energy-related development.
- Task 3 predicts the cumulative impacts that could be expected to occur to air, water, socioeconomic, and other resources if the development occurs as projected in the forecast developed under Task 2.

A series of reports have been prepared to present the results of the PRB Coal Review task studies. The Task 1, 2, and 3 reports represent components of a technical study of cumulative development in the PRB; they do not evaluate specific proposed projects, but they provide information that BLM is using to evaluate the cumulative impacts that would be expected to occur if specific projects or applications, such as the Proposed Action, are approved. The contents and completion dates of the various task reports include:

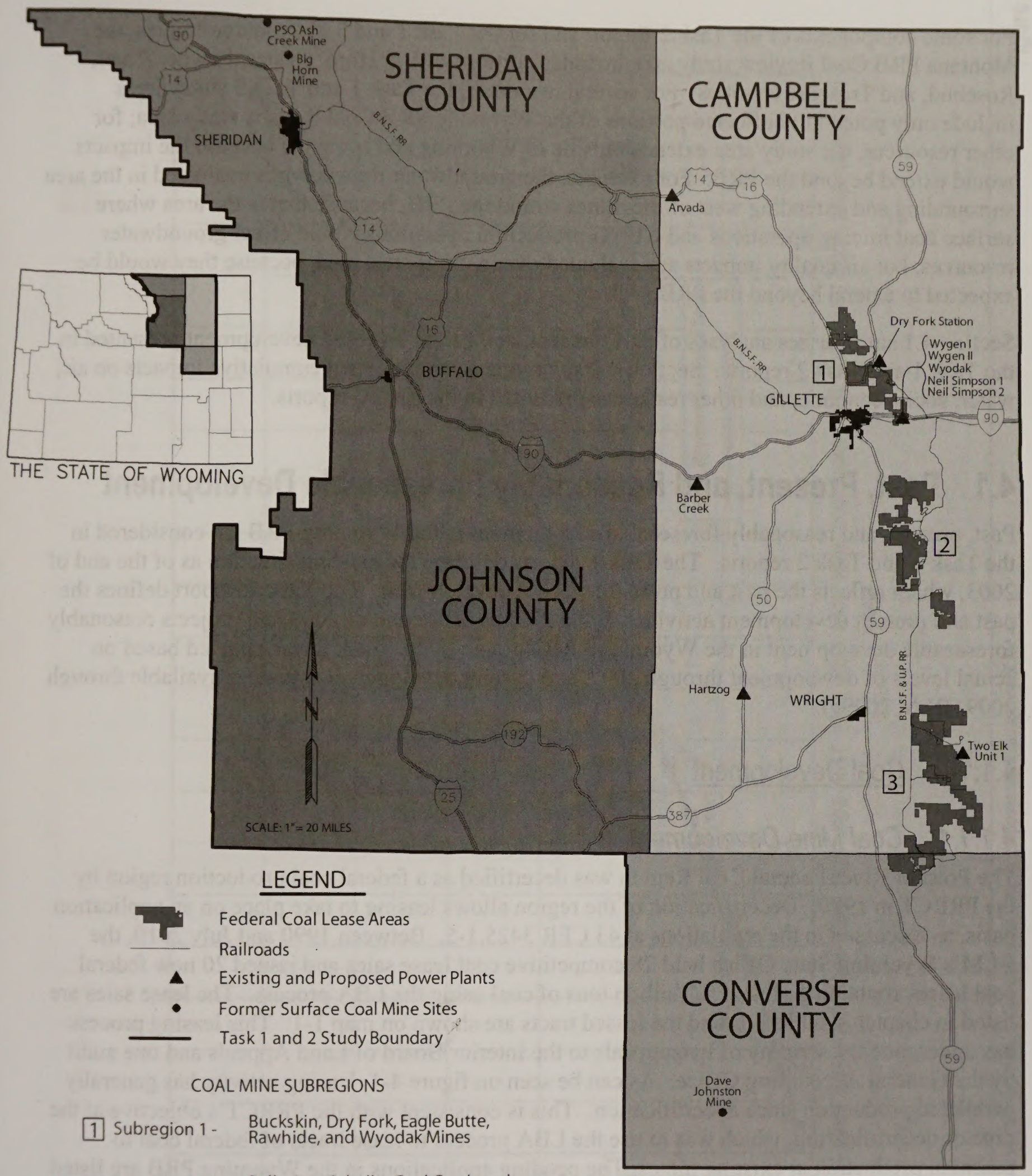
- Task 1A Report (BLM 2005a): existing air quality conditions;

[1] Refer to page xx for a list of abbreviations and acronyms used in this document.

- Task 1B Report (BLM 2006c) and update to the Task 1B Report (BLM 2009e): existing water resources conditions;
- Task 1C Report (BLM 2005b): existing social/economic conditions;
- Task 1D Report (BLM 2005c): existing other environmental resource conditions;
- Task 2 Report (BLM 2005d) and update to the Task 2 Report (BLM 2009c): past and present coal, oil and gas, and other development;
- Task 3A Report (BLM 2006d) and updates to the Task 3A Report (BLM 2008a, BLM 2009d): predicted air quality conditions;
- Task 3B Report (BLM 2006e) and update to the Task 3B Report (BLM 2009f): predicted water resources conditions;
- Task 3B Phase 2 evaluation (BLM, in progress): predicted water resource conditions;
- Task 3C Report (BLM 2005e): predicted social/economic conditions; and
- Task 3D Report (BLM 2005f) and update to the Task 3D Report (BLM 2009g): predicted other resource conditions.

The Task 1 and Task 2 reports have been completed. The update to the Task 2 Report (BLM 2009c) is reflected in this document. The Task 3 reports for air quality conditions, water resources conditions, social/economic conditions, and other resource conditions have also been completed. Information from the 2008 update to the Task 3A Report (BLM 2008a) was included in the Hay Creek II LBA draft EIS to project air quality effects for 2015. After the draft EIS was issued, modeling of cumulative air quality effects for 2020 was completed (BLM 2009c); data and analyses for both model years are reflected in this final EIS. The groundwater impacts modeling portion of the Cumulative Water Resources Effects (BLM 2009e) was recently completed and is also reflected in this document, along with the cumulative surface water effects. The Task 3B Phase 2 evaluation of water resource conditions is in progress. The information in these reports is summarized later in this chapter, and the completed reports are available for viewing at the BLM offices in Casper and Cheyenne and on the Wyoming BLM at: http://www.blm.gov/wy/st/en/programs/energy/Coal_Resources/PRB_Coal/prbdocs.html.

The PRB includes portions of northeastern Wyoming and southeastern Montana. The Wyoming portion of the PRB is the primary focus of the PRB Coal Review reports. The Montana portion of the PRB is included in the Task 2 Report and in the Task 1 and 3 air resources studies. For the majority of resources in the Task 1 reports and for the Task 2 Report, the Wyoming portion of the PRB Coal Review study area encompasses all of Campbell County, all of Sheridan and Johnson counties outside of the Bighorn National Forest, and the northern portion of Converse County (map 4-1).



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 4-1

Wyoming Study Area for PRB Coal Review Studies Evaluating Current and Projected Levels of Development

For some components of the Task 2 Report and for the Task 1 and 3 air resource studies, the Montana PRB Coal Review study area includes portions of Big Horn, Custer, Powder River, Rosebud, and Treasure counties. For several resources, the Task 1 and Task 3 study areas include only potentially affected portions of the Wyoming PRB Coal Review study area; for other resources, the study area extends outside of Wyoming and Montana because the impacts would extend beyond the PRB. For example, the groundwater drawdown is evaluated in the area surrounding and extending west of the mines within the PRB, because that is the area where surface coal mining operations and CBNG production operations would affect groundwater resources; but air quality impacts are evaluated over a multi-state area, because they would be expected to extend beyond the PRB.

Section 4.1 summarizes analyses of past, present, and future levels of development presented in the Task 1 and Task 2 reports. Section 4.2 summarizes the predicted cumulative impacts on air, water, socioeconomic, and other resources presented in the Task 3 reports.

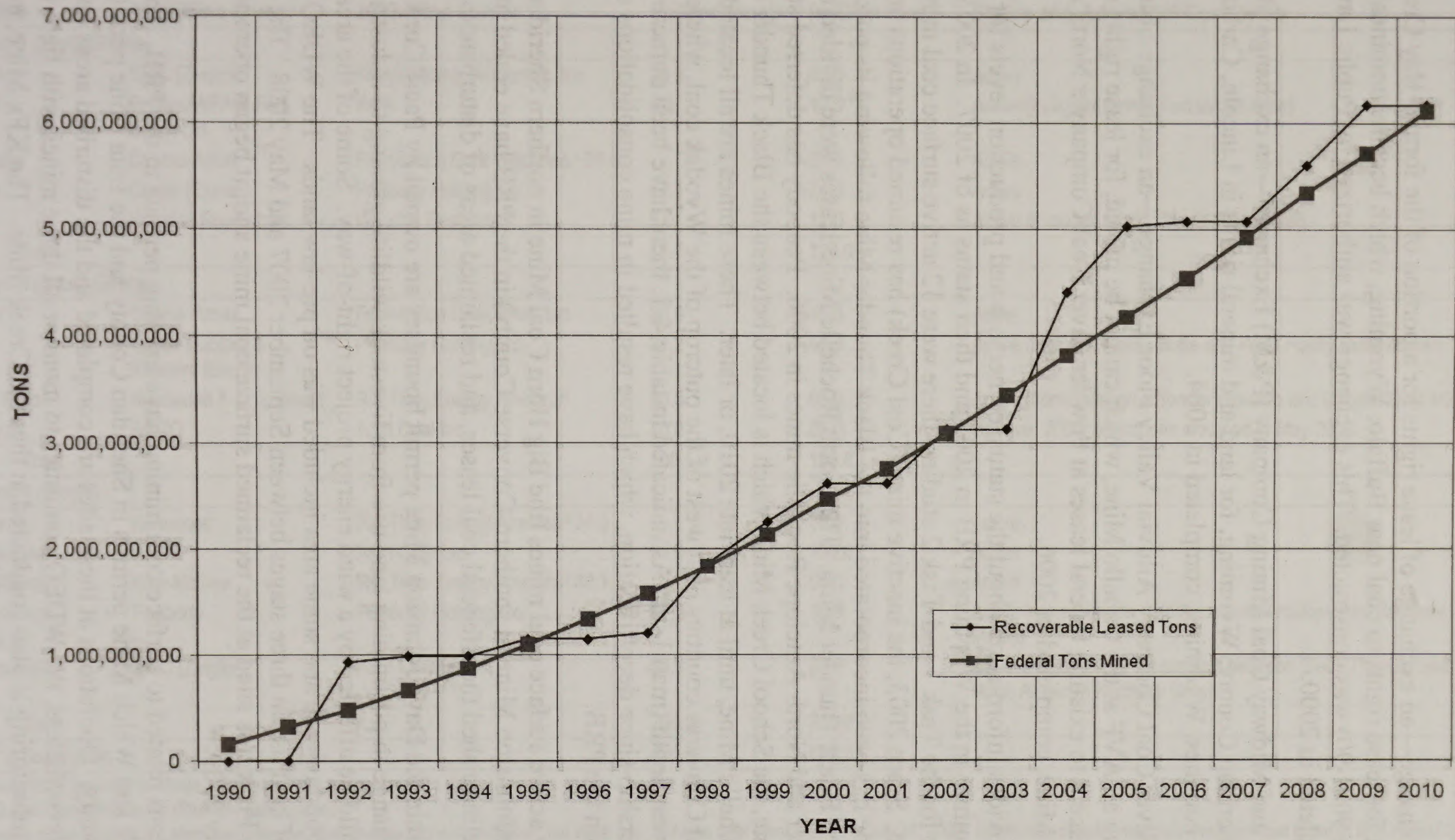
4.1 Past, Present, and Reasonably Foreseeable Development

Past, present, and reasonably foreseeable development in the Wyoming PRB are considered in the Task 1 and Task 2 reports. The Task 1 reports describe the existing situation as of the end of 2003, which reflects the past and present levels of development. The Task 2 Report defines the past and present development activities in the PRB as of the end of 2003 and projects reasonably foreseeable development in the Wyoming PRB through 2020. Task 2 was updated based on actual levels of development through 2007, and current development estimates available through 2009 (BLM 2009c).

4.1.1 Coal Development

4.1.1.1 Coal Mine Development

The Powder River Federal Coal Region was decertified as a federal coal production region by the PRRCT in 1990. Decertification of the region allows leasing to take place on an application basis, as discussed in the regulations at 43 CFR 3425.1-5. Between 1990 and July 2010, the BLM's Wyoming State Office held 28 competitive coal lease sales and issued 20 new federal coal leases containing almost 5.7 billion tons of coal using the LBA process. The lease sales are listed in chapter 1, table 1-1, and the leased tracts are shown on map 1-1. This leasing process has undergone the scrutiny of two appeals to the Interior Board of Land Appeals and one audit by the General Accounting Office. As can be seen on figure 4-1, leasing activity has generally paralleled production since decertification. This is consistent with the PRRCT's objective at the time of decertification, which was to use the LBA process to lease tracts of federal coal to maintain production at existing mines. The pending applications in the Wyoming PRB are listed in table 1-2.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Figure 4-1

Recoverable Tons of Federal Coal Leased Versus Tons of Federal Coal Mined Since 1990 in Campbell and Converse Counties, Wyoming

The BLM has also completed three exchanges involving federal coal resources in the Wyoming PRB since decertification.

- Belco Exchange—an exchange of lease rights for a portion of the former Hay Creek federal coal tract for lease rights to coal near Buffalo, Wyoming, which became unmineable when Interstate 90 (I-90) was constructed. This exchange was authorized by Public Law 95-554 and completed in 2000.
- Pittsburg and Midway Coal Mining Company (P&M) Exchange—an exchange of federal coal in Sheridan County, Wyoming, for land and mineral rights in Lincoln, Carbon, and Sheridan counties, Wyoming, completed in 2004.
- Powder River Coal Company Alluvial Valley Floor Exchange—an exchange of lease rights underlying an AVF at the Caballo Mine, which cannot be mined, for lease rights of equal value adjacent to existing federal leases at Powder River Coal Company's North Antelope Rochelle Mine, completed in 2006.

Table 4-1 provides information about the status, ownership and production levels for the existing surface coal mines in the Wyoming PRB in 2003 and their status as of 2007. In 2003, the baseline year for the Task 1 and Task 2 studies, there were 12 active surface coal mines and one inactive mine. Since 2003, the inactive mine (Coal Creek) has resumed operations and the North Rochelle Mine has been incorporated into the Black Thunder Mine following its purchase by the operator of the Black Thunder Mine. The North Rochelle Mine leases were divided between Black Thunder and North Antelope Rochelle mines in 2006. Peabody has deferred startup of their new mine, the School Creek Mine which is located between the Black Thunder and North Antelope Rochelle Mine, until at least late 2010, or later. These mines are all located in Campbell and Converse counties, just west of the outcrop of the Wyodak coal, where the coal is at the shallowest depth (map 1-1). As indicated in table 4-1, there have been numerous changes in mine ownership since decertification, which have resulted in mine consolidations and mine closings within the PRB.

Two recently active surface coal mines (the Big Horn Coal Mine in northern Sheridan County and the Dave Johnston Mine in southern Converse County) in the PRB have ended mining operations, relinquished their federal coal leases, and reclaimed areas of disturbance.

The lands within the Dave Johnston Mine permit boundary are owned by PacifiCorp. PacifiCorp requested a change in postmining land use from livestock/wildlife grazing to industrial for the areas that would be affected by a wind energy project right-of-way. Some of the area was on full reclamation bond release and some area included was on pre-law lands. The WDEQ approved this change of land use in three stages between September 2007 and May 2008. The Glenrock Wind Energy Project is sited at the reclaimed surface coal mine and; it began operations in late 2008 and early 2009.

Other operations related to surface coal mining have existing permits in the PRB. These include the Ash Creek and Welch Mine permits in Sheridan County and the Izita Mine permit in Campbell County. Operations at these sites are completed and the disturbed areas have been reclaimed. Nevertheless, the WDEQ continues to monitor all three mines with field inspections; groundwater monitoring is also conducted at the Ash Creek Mine. The KFx Mine, located north of Gillette on privately owned coal, has stopped mining coal for processing at the KFx coal enhancement plant, which is discussed later in this chapter.

Table 4-1. Status and Ownership of Wyoming PRB Coal Mines for 2003, the PRB Coal Review Baseline Year, and for 2007

2003 Mine	1994 Mine Owner	2007 Mine Owner	2007 Coal Production (million tons)[a]	Permitted Production Level (million tons)[b]	Status and Additional Comments
Subregion 1 (North Gillette)					
Buckskin	SMC (Zeigler)	Kiewit Mining Properties, Inc.	25.3	42.0	Active
Dry Fork	Phillips/WFA & Fort Union Ltd	WFA	5.3	15.0	Active (includes former Fort Union Mine)
Eagle Butte	Cyprus-Amax	Foundation Coal West, Inc.[c] 25.0		35.0	Active
Rawhide	Carter (Exxon)	Peabody Holding Co.	17.1	24.0	Active
Wyodak	Wyodak Resources	Wyodak Resources	5.0	12.0	Active (includes former Clovis Point Mine)
Total			77.7	128.0	
Subregion 2 (South Gillette)					
Belle Ayr	Cyprus-Amax	Foundation Coal West, Inc.	26.6	45.0	Active
Caballo	Carter (Exxon) & Western Energy	Peabody Holding Co.	31.2	50.0	Active (includes Rocky Butte and West Rocky Butte leases)
Cordero Rojo	Kennecott & Drummond	Rio Tinto Energy America[d]	40.5	65.0	Active (consolidation of former Cordero and Caballo Rojo Mines)
Coal Creek	ARCO	Arch Coal Inc.	10.2	25.0	Inactive 2000, operations resumed in May 2006
Total			108.5	185.0	
Subregion 3 (Wright)					
Antelope	Kennecott	Rio Tinto Energy America[d] 34.5		36.0	Active
Black Thunder	ARCO	Arch Coal Inc.	65.3	100.0	Active
Jacobs Ranch	Kerr-McGee	Rio Tinto Energy America[d] 38.1		55.0	Active
North Antelope Rochelle	Peabody	Peabody Holding Co.	91.5	99.0	Active (consolidation of former North Antelope and Rochelle Mines)
North Rochelle	SMC (Zeigler)	Arch Coal Inc.	20.9	35.0	Inactive since 2005, leases split between Black Thunder and North Antelope Rochelle Mines
Total			250.3	325.0	
Total for 3 Subregions			436.5	638.0	

[a] Wyoming State Inspector of Mines (2007) and Shamley pers. comm.

[b] WDEQ 2007 permitting levels (Shamley pers. comm.)

[c] Ownership of the Eagle Butte Mine and Belle Ayr Mine changed from Foundation Coal West, Inc., to Alpha Coal West, Inc. as of July 31, 2009. Notification of new ownership was submitted to the BLM in August 2009.

[d] Kennecott Energy Company changed its name to Rio Tinto Energy America in 2006 and to Cloud Peak Energy Resources LLC in 2009.

In March 2008, the Fort Union plant was idled down. In August 2010, Evergreen Energy Inc. agreed to sell the Fort Union site to Synthetic Fuels LLC of Colorado, which has plans to develop a coal-to-liquids facility on the site (MarketWatch, Inc. 2010).

The active mines in the Wyoming PRB are geographically grouped into three subregions (map 4-1) for purposes of this cumulative impact discussion: 1) North Gillette; 2) South Gillette; and 3) Wright. Table 4-1 lists the mines included in each subregion.

A fourth subregion includes former and proposed mines in Sheridan County, and existing mines just north of Sheridan County, in Montana. There are currently no active mines in the Wyoming portion of the fourth subregion. However, the 2005 Task 2 Report (BLM 2005b) projected that a new mine would be developed near Sheridan by 2010. In April 2007, P&M and CONSOL Energy Inc. announced that they had formed a new company, Youngs Creek Mining Company, LLC, and entered into a joint agreement to develop a new mine in Wyoming north of Sheridan (Reuters 2007). According to the announcement, engineering, environmental, and permitting work are in progress, but actual mine construction will not start until the joint venture has enough coal sales under contract to justify the investment. The coal reserves included in this project are all privately owned (Shewski 2007).

The surface coal mines listed in table 4-1 currently produce over 96% of the coal produced in Wyoming each year. Since 1989, coal production in the PRB has increased by an average of 6% per year. The increasing production is primarily because of increasing sales of low-sulfur, low-cost PRB coal to electric utilities who must comply with the phase I requirements of Title III of the 1990 CAA Amendments. Electric utilities account for 97% of Wyoming's coal sales. In 2009, production from the Wyoming PRB coal mines dropped by about 7% from the 2008 levels, the first drop since the early 1900s. This drop coincided with a national coal production decline resulting from reduced industrial electric demand in 2009.

In 2003, the baseline year for the PRB Coal Review, more than 35% of the coal mined in the United States came from the Wyoming PRB. According to the DOE, that amount had increased to about 38% by 2007 and to over 38% by 2009 (U.S. Energy Information Administration 2009a and 2009b).

The BLM estimates that the surface coal mines listed in table 4-1 currently have about 125,180 acres of federal coal leased in Campbell and Converse counties. This represents approximately 4.1% of Campbell County, where the majority of the leases are located.

Both the 2005 and updated 2009 Task 2 reports projected coal development into the future for the years 2010, 2015, and 2020. Due to the variables associated with future coal production, two projected coal production scenarios (representing an upper and a lower production level) were developed to bracket the most likely foreseeable regional coal production level. The basis for the projected production levels included:

- analysis of historic PRB production levels in comparison to the gross domestic product and national coal demand;
- analysis of PRB coal market forecasts that model the impact of gross domestic product growth, potential regulatory changes affecting coal-fired power plants, and mining and transportation costs on PRB coal demand;

- availability, projected production cost, and quality of future mine-specific coal reserves within the PRB region; and
- availability of adequate infrastructure for coal transportation.

The projected upper and lower production levels subsequently were allocated to the Wyoming PRB subregions, discussed above, and to individual mines based on past market shares. Individual mine production levels were reviewed relative to potential future production constraints (e.g., loadout capacities), permitted production levels, mining costs, and coal quality. Then the projected future production was aggregated on a subregion basis. The actual 2003 and 2005 production levels and the two projected coal production scenarios for those years are shown in figure 4-2 and tables 4-2 and 4-3. The actual 2007 and 2008 production levels are also shown on figure 4-2 for reference.

Tables 4-2 and 4-3 show the cumulative coal mining disturbance as of the baseline year and the cumulative coal mine disturbance projected for the future years for the upper and lower coal production scenarios.

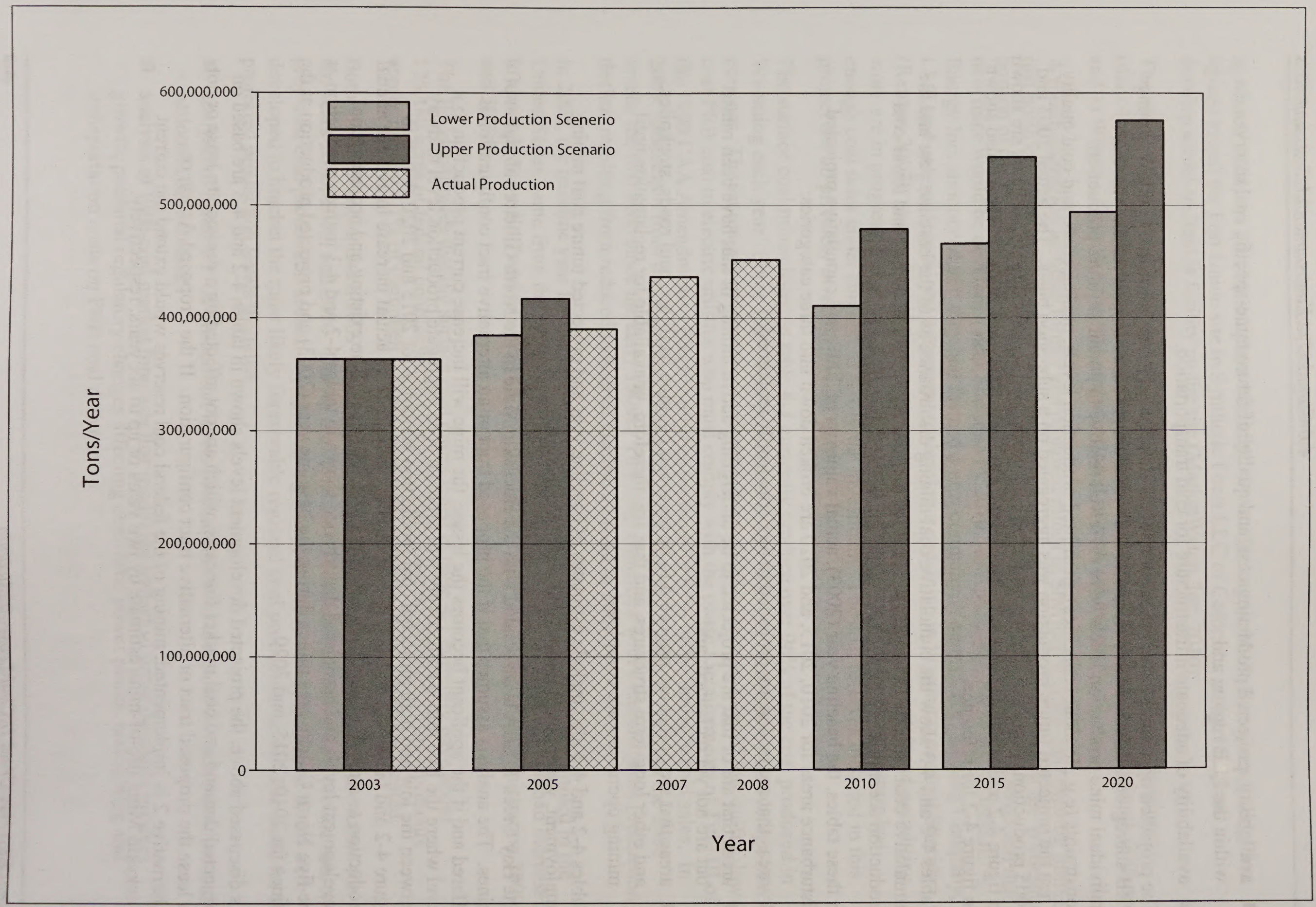
In these tables, the baseline year (2003), actual values as of 2007, and cumulative projected disturbance areas for 2010, 2015, and 2020 are broken down into three categories:

- areas that are or that are projected to be permanently reclaimed;
- areas that are or that are projected to be undergoing active mining or that have been mined but are not yet reclaimed; and
- areas that are or that are projected to be occupied by mine facilities, haul roads, stockpiles, and other long-term structures, and that are, therefore, unavailable for reclamation until mining operations are completed.

Tables 4-2 and 4-3 also include estimates of baseline year and projected future coal mining employment, water consumption, and water production.

The Hay Creek II LBA is associated with the Buckskin Mine in the North Gillette subregion of mines. The analysis assumes that if the proposed tract or an alternative tract configuration is offered and if the applicant becomes the lessee, the mine will increase current production to a level where the five mines collectively will produce at an aggregate production level midway between the low and high projected coal production scenarios for 2015 and 2020 shown in figure 4-2 and tables 4-2 and 4-3; Kiewit does not anticipate an actual increase in average annual production as a result of acquiring a new maintenance tract. The existing and projected coal development levels and associated disturbance shown in tables 4-2 and 4-3 include production at the five North Gillette area mines during the baseline year (2003) and projected production at the mines for 2010, 2015, and 2020.

As discussed above, the projected development levels shown in tables 4-2 and 4-3 are based on projected demand and coal market forecasts, which are not affected by a decision to lease or not to lease the proposed tract or alternative tract configuration. If the Proposed Action or Alternative 2 is implemented, mining of the federal coal reserves would extend the current Buckskin Mine life-of-mine estimate by two years or up to six years, respectively.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Figure 4-2

Projected and Actual Total Coal Production from Campbell and Converse Counties under the Lower and Upper Production Scenarios

Table 4-2. Actual and Projected Wyoming PRB Coal Mine Development, Lower Coal Production Scenario

Subregion	Annual Production (million tons)	Cumulative Disturbed Area (acres)	Cumulative Permanently Reclaimed Area (acres)	Cumulative Active Mining Area and Unreclaimed Mined Area (acres)	Cumulative Area Disturbed and Unavailable for Reclamation[a] (acres)	Total Mine Employment	Annual Water Consumption (mmgpy)	Annual Water Production (acre-feet)
Original Baseline Year (2003)								
North Gillette Subregion	55	12,047	3,054	3,360	5,633	746	387	191
South Gillette Subregion	77	21,249	6,783	6,107	8,359	861	544	447
Wright Subregion	232	35,498 11,4	01 13,9	92	10,105	3,090	1,709	748
Total for 2003	364	68,794 21,2	38 23,4	59	24,097	4,697	2,640	1,386
Actual 2007								
North Gillette Subregion	78	14,421	3,658	8,342	5,781	1,032	351	191
South Gillette Subregion	100	23,630	6,441	12,353	9,273	1,424	544	447
Wright Subregion	250	45,542 15,7	85 31,5	77	11,941	3,077	1,709	748
Total for 2007	428	83,593 25,8	84 52,2	72	24,338	5,533	2,604	1,386
Reasonably Foreseeable Development for 2010								
North Gillette Subregion	62	15,231 5,00	4 3,96	8	6,260	787	628	165
South Gillette Subregion	95 28,0	21	12,183	6,830	9,008	1,323	50	675
Wright Subregion	254	55,410 27,7	51 16,5	88	11,070	3,153	1,115	1,419
Total for 2010	411	98,662 44,9	38 27,3	86	26,338	5,263	1,793	2,258
Reasonably Foreseeable Development for 2015								
North Gillette Subregion	74	17,457 6,65	4 4,20	2	6,601	830	724	165
South Gillette Subregion	112 32,3	56	15,683	7,314	9,359	1,369	458	675
Wright Subregion	281	67,423 38,8	51 16,9	83	11,589	3,186	1,277	1,419
Total for 2015	467	117,236 61,1	88 28,4	99	27,549	5,405	2,059	2,258
Reasonably Foreseeable Development for 2020								
North Gillette Subregion	78	19,729 8,42	9 4,35	0	6,950	840	456	165
South Gillette Subregion	126 36,9	94	19,683	7,589	9,723	1,476	72	675
Wright Subregion	291	80,720 51,3	51 17,2	43	12,124	3,215	1,334	1,419
Total for 2020	495	137,443 79,4	63 29,1	82	28,797	5,531	2,162	2,258

[a] Area unavailable for reclamation includes disturbed areas occupied by permanent or long-term facilities such as buildings, roads, and topsoil stockpiles.

Source: Updated Task 2 Report (BLM 2009c).

Table 4-3. Actual and Projected Wyoming PRB Coal Mine Development, Upper Coal Production Scenario

Subregion	Annual Production (million tons)	Cumulative Disturbed Area (acres)	Cumulative Permanently Reclaimed Area (acres)	Cumulative Active Mining Area and Unreclaimed Mined Area (acres)	Cumulative Area Disturbed and Unavailable for Reclamation[a] (acres)	Total Mine Employment	Annual Water Consumption (mmgpy)	Annual Water Production (acre-feet)
Original Baseline Year (2003)								
North Gillette Subregion	55	12,047	3,054	3,360	5,633	746	387	191
South Gillette Subregion	77	21,249	6,783	6,107	8,359	861	544	447
Wright Subregion	232	35,498	11,401	13,992	10,105	3,090	1,709	748
Total for 2003	364	68,794	21,238	23,459	24,097	4,697	2,640	1,386
Actual 2007								
North Gillette Subregion	78	14,421	3,658	8,342	5,781	1,032	351	191
South Gillette Subregion	100	23,630	6,441	12,353	9,273	1,424	544	447
Wright Subregion	250	45,542	15,785	31,577	11,941	3,077	1,709	748
Total for 2007	428	83,593	25,884	52,272	24,338	5,533	2,604	1,386
Reasonably Foreseeable Development for 2010								
North Gillette Subregion	78	15,911	5,404	4,217	6,290	811	788	165
South Gillette Subregion	117	29,279	13,416	7,536	8,328	1,375	58	675
Wright Subregion	284	57,258	27,951	18,236	11,070	3,153	1,184	1,419
Total for 2010	479	102,448	46,771	29,989	25,688	5,339	2,030	2,258
Reasonably Foreseeable Development for 2015								
North Gillette Subregion	104	18,490	7,329	4,500	6,660	905	492	165
South Gillette Subregion	138	35,624	18,616	8,248	8,760	1,431	75	675
Wright Subregion	301	70,431	39,451	19,391	11,589	3,186	1,333	1,419
Total for 2015	543	124,545	65,396	32,139	27,009	5,522	1,897	2,258
Reasonably Foreseeable Development for 2020								
North Gillette Subregion	121	21,311	9,529	4,766	7,013	1,019	880	165
South Gillette Subregion	148	42,981	25,016	8,758	9,206	1,444	86	675
Wright Subregion	307	84,797	51,651	21,021	12,124	3,215	1,437	1,419
Total for 2020	576	149,089	86,196	34,545	28,345	5,678	2,403	2,258

[a] Area unavailable for reclamation includes disturbed areas occupied by permanent or long-term facilities such as buildings, roads, and topsoil stockpiles.

Source: Updated Task 2 Report (BLM 2009c).

As discussed in sections 1.1.3.1, Kiewit estimates that the existing Buckskin Mine had approximately 344.3 million tons of recoverable coal reserves at the end of 2008. Overall, the mine had produced a total of 339.8 million tons of coal as of December 2008, with annual production averaging 20.6 million tons over the previous six years. The mine's current air quality permit as approved by the WDEQ allows mining of up to 42 million tons of coal per year. If the mine produces coal at the projected average annual estimate of 25 million tons, the remaining recoverable reserves would be depleted in less than 14 years (2022). If the mine increases production to the permitted level, the remaining recoverable reserves at the Buckskin Mine would be depleted in about 8.8 years (2016). Kiewit estimates that the proposed tract includes approximately 54.1 million tons of recoverable coal. Based on that estimate, acquisition of the proposed tract would increase the recoverable reserves at the Buckskin Mine by almost 14.6%. At the estimated future average annual production level (25 million tons), mine life would be extended by over two years. However, if production levels increase to the currently permitted level (42 million tons per year) or if the WDEQ approves a higher annual rate of production, the coal would be recovered more quickly.

4.1.1.2 Coal-Related Development

Coal-related development as defined for this analysis includes railroads, coal-fired power plants, major (230-kilovolt [kV]) transmission lines, and coal technology projects. Table 4-4 summarizes the estimated disturbance associated with coal-related development activities for the baseline year and the projected disturbance through 2020. The subsequent paragraphs summarize the existing coal-related development in the Wyoming PRB and the reasonably foreseeable development considered in the PRB Coal Review.

Table 4-4. Actual and Projected Wyoming PRB Coal-Related Development (acres)

Actual			Projected	
2003 2	007 2	010	2015	2020
4,892 5,80	2 5,96	3	6,915	6,914

Source: Updated Task 2 Report (BLM 2009c).

Coal Transportation

As discussed above, electric utilities account for about 97% of Wyoming's coal sales. Most of the coal sold to electric utilities is transported to power plants by rail. A small part, about 2% in 2007, of national coal production is exported abroad, but data are not published as to where this export coal is produced. A joint BNSF and UP rail line serves the coal mines in the Wright and South Gillette subregions. For the baseline year of 2003, the existing capacity of the line was estimated at approximately 350 million tons per year. For that same year, the existing capacity of the BNSF line, which services the North Gillette subregion, was estimated at 250 million tons per year.

The PRB Coal Review projected that two coal transportation projects would be developed prior to 2020 in Wyoming: expansion of the BNSF and UP rail facilities south of Gillette and the construction of the Dakota, Minnesota and Eastern Railroad Corporation (DM&E) rail line in Wyoming and South Dakota. A third project proposed by the Tongue River Rail Company would be built between Decker and Miles City, Montana.

BNSF and UP completed work to improve sections of the existing joint rail line and had increased capacity from 350 million tons per year to 450 million tons per year by 2008 with plans to improve additional sections of the existing joint rail line and to further increase capacity to 500 million tons per year by 2012. This work includes construction of third and fourth main line track segments where needed. The increased capacity would accommodate the projected upper and lower production rates at the southern mines, which are projected to produce 439 million tons per year and 455 million tons per year by 2020. The remaining planned expansion projects are considered highly likely to occur.

The proposed DM&E rail line would include new rail construction in South Dakota and Wyoming (approximately 15 and 265 miles, respectively) and 600 miles of rail line rehabilitation in South Dakota and Minnesota. Approximately 78 miles of the new rail line construction would provide new rail services to the coal mines in the South Gillette and Wright subregions. The Surface Transportation Board released a final supplemental EIS for the DM&E project on December 30, 2005, and granted final approval to construct the rail line on February 15, 2006. The supplemental EIS, which addressed issues that were successfully appealed after an EIS was completed in 2001, was also appealed. The U.S. Court of Appeals for the Eighth Circuit upheld the appeal of the supplemental EIS in December 2006. In 2007, Canadian Pacific Railway Ltd. (CP) acquired DM&E and the Surface Transportation Board approved CP's acquisition of DM&E on September 30, 2008 (All Business 2008). The railroad's expansion into the PRB would require a substantial financial commitment, and CP is concentrating on the integration of DM&E's operation before making a decision on the expansion project. No decision has been made on whether or not CP will build the PRB extension. This decision is contingent on several conditions: 1) acquire the necessary right-of-way to build the line; 2) execute agreements with PRB mines on terms for operations by DM&E over their loading tracks and facilities; 3) secure sufficient contractual commitments from prospective coal shippers to route their traffic over the PRB line to justify the investment required to build the line; 4) arrange financing for the project; and 5) an economic and regulatory environment that would support a long-term investment of this magnitude must be present (Dakota, Minnesota & Eastern Railroad 2009).

The Surface Transportation Board announced approval of the final stretch of the rail line proposed by the Tongue River Railroad Company in October 2007. The company must acquire necessary federal and state permits and rights-of-way through private and public property before constructing the line. If it is constructed, it would provide a shorter route for some of the mines in the North Gillette subregion, which ship coal on the existing BNSF rail line (Brown 2007).

For the purposes of the PRB Coal Review, it was projected that the DM&E line would be constructed when the total rail haulage requirement from the eastern Wyoming PRB reaches 450 to 500 million tons per year and would potentially be operational by 2015. The construction of this rail line is considered moderately likely to occur. The PRB Coal Review assigned a low likelihood of development by 2010 under the upper coal production scenario, and projected the construction of the Tongue River Railroad Company line would not occur unless the Otter Creek

Mine is developed. Development of the Otter Creek tracts—more than a billion tons of state and private coal—could initiate expansion of the region's coal industry and facilitate construction of the Tongue River Railroad. Appraisals of the Otter Creek lease tracts were completed in April 2009 (Brown 2009) and the Montana Land Board voted to lease the 572 million tons of state-owned coal in December 2009 (Dennison 2009). The Montana Board of Land Commissioners voted to approve the lease of the Otter Creek tracts to Ark Land Company on March 18, 2010 (Montana Department of Natural Resources and Conservation 2010).

Electric Power Generation

Five coal-fired power plants are in the Wyoming PRB study area analyzed in Tasks 1 and 2 (map 4-1). Black Hills Power Corporation owns and operates the Neal Simpson Units 1 and 2 (21.7 megawatts [MW] and 80 MW, respectively), Wygen I and II (80 MW and 95 MW, respectively), and Wyodak (330 MW) power plants, all of which are located approximately 5 miles east of Gillette, Wyoming. Pacific Power and Light's Dave Johnston Power Plant is located near Glenrock, Wyoming, outside of, but adjacent to, the study area.

Three separate interconnected gas-fired power plants (Hartzog, Arvada, and Barber Creek) are also located near Gillette, Wyoming (map 4-1). Each contains three separate 5-MW-rated turbines that provide electric power to Basin Electric and its customers. In winter, the maximum capacity can reach 22.6 MW from each site. All units are in operating condition, although they do not operate at maximum capacity.

Several additional power plants are projected to be built prior to 2020. The PRB Coal Review assumed that proposed coal-fired power plants that plan to initiate operation by 2010 would have to have been undergoing air quality permit review by 2003 in order to obtain the required construction permits and complete construction by 2010. The study identified the following four projects as likely for development by 2015.

- Black Hills Power and Light has received an air permit for the start of construction of WYGEN III; issues related to that permit currently are being resolved. WYGEN III would be a 100-MW facility located adjacent to WYGEN II. The plant is in construction and nearing completion. Operation of this facility by 2015 is considered highly likely.
- Basin Electric Power Cooperative has obtained an air construction permit for a 385-MW coal-fired power plant (Dry Fork Station) near Gillette, Wyoming. The estimated startup date is 2011. It is estimated that 1.2 million tons of coal per year would be required to fuel the facility. The cooling technology includes a dry scrubber, since that type of operation commonly is installed for PRB coal-fired units. Operation of this facility by 2015 is considered highly likely.
- North American Power Group has permitted a 280-MW coal-fired power plant (Two Elk Unit #1) at a 40-acre site located approximately 15 miles southeast of Wright, Wyoming. As originally permitted, the project also would include installation of a 45-MW gas-fired turbine. The air permit originally was issued in August 2002; construction has been initiated, with actual startup expected in 2011. This unit would be dry-cooled, requiring very little water. Campbell County approved more than $123 million in industrial revenue bonds for application to the Two-Elk financing. Operation of this facility by 2015 is considered moderately likely.

- Wyoming Power Company (a subsidiary of NAPG) submitted a permit application for Two-Elk Unit #2. This unit would be a 750-MW supercritical pulverized coal-fired electric generating unit that would burn coal from the nearby mines. The unit would be located on an approximately 60-acre site adjacent to Two-Elk Unit #1. The permit was expected to be issued in 2008, and operation of this unit was considered moderately likely in 2015. Currently, the Wyoming Power Company (a subsidiary of NAPG) has a proposal for Two Elk Unit #2. Some paperwork for this project was filed with WDEQ. The paperwork was returned in March 2010.

The PRB Coal Review assumes that all existing power plants in the PRB region would remain operational through 2020.

Transmission Lines

Major transmission lines in the Wyoming PRB study area that support the regional distribution system are associated with the Dave Johnston Power Plant located near Glenrock, Wyoming, and the power plants operated by Black Hills Power Corporation, which are located east of Gillette. These 230-kV transmission lines have been in place for several years, and their associated permanent disturbance is minimal. Distribution power lines associated with conventional oil and gas and CBNG development also occur within the study area. For the PRB Coal Review, these lines were included by factoring them in proportionally on a per-well basis.

The PRB Coal Review estimated that by 2020 four major transmission lines would be constructed. Markets would dictate the size and location of such facilities, and these are not known as of this time. Because transmission lines are a necessary supporting infrastructure for power generating facilities to provide connection to the grid, the PRB Coal Review assumes they would be required as part of the overall system development for the proposed power plants discussed in the previous section. Six specific proposals for these transmission lines have been identified by the PRB Coal Review analysis update. Information is insufficient to analyze or assign likelihood of development by 2020.

The governors of California, Nevada, Utah, and Wyoming entered into a memorandum of understanding to encourage development of a high voltage power transmission line, the Frontier Line, connecting those states in April 2005. Since that time, no specific plans have been announced as to the location or timing of the Frontier Line. The 345-kV Wyoming-Colorado Intertie as well as the Trans West and Gateway West and South projects have been proposed in Wyoming to move power from Wyoming to growing load demands in Idaho, Nevada, and other areas in the western United States (Hodges 2007). The TransWestern Express proposes to move electric power from Wyoming to Arizona through Colorado or Utah. The High Plains Express is proposed to move power from Wyoming to New Mexico and Arizona.

An estimated 1,380 MW of new power plant production capacity and 250 MW of new wind energy production capacity are anticipated in the Task 2 study area by 2015.One new 300-MW wind energy project and potentially up to 700 MW of additional power generation provided by coal-fired power plants is projected for 2020. This level of production would require construction of additional transmission line capacity. It is assumed that new transmission lines would be constructed to connect new power plants to the grid. It is projected that these transmission lines would be constructed by 2015 to connect to outside markets. However,

specific location(s), capacities, and effects on the existing system cannot be determined at this time.

Coal Conversion Technology

With rising energy prices, there has been considerable interest in either enhancing the quality of PRB coal and/or converting the coal to other fuels. Test facilities were previously constructed by AMAX (predecessor to Foundation Coal West, Inc. and Alpha Coal West, Inc.) at the Belle Ayr Mine, and by ENCOAL at the Buckskin Mine, but no commercial production occurred, and these facilities have either been dismantled or are no longer in use. Evergreen Energy (formerly operating as KFx) previously built a prototype commercial-scale coal upgrading plant near the old Fort Union Mine (now part of the Dry Fork Mine). The facility did achieve commercial production levels of K-Fuel® (the company's enhanced coal product) for a short period (2006 through early 2008); it was used for testing and demonstration purposes. Approximately 60 people were employed at the plant. Evergreen Energy decided to idle the plant in May 2008, laying off all but caretaker staff.

The following coal conversion projects have been proposed, and are described in some detail in the PRB Coal Review. These projects were not included in the PRB Coal Review analysis because the likelihood of their occurrence was not known when the analysis was conducted:

- *Evergreen Energy Coal Beneficiation Project.* Long-term plans for Evergreen Energy's coal upgrading plant near the Dry Fork Mine have not been announced, although reopening and dismantling the currently idle plant and redeploying some of the equipment to another location have surfaced as possibilities.
- *Rentech Inc. Coal Liquefaction Project.* In 2004, Rentech completed a feasibility study for a coal liquefaction facility, based on the historic Fischer-Tropsch process, to produce low-sulfur diesel fuel from sub-bituminous coal. Thereafter, Rentech continued to consider the potential of developing a commercial-scale facility in the PRB, while simultaneously investing in a product demonstration facility near Denver, Colorado.
- *White Energy Company, NRG Energy, and Buckskin Mining Company.* In March 2008, the three companies entered into a joint development agreement to complete a feasibility study of building and operating a plant having a capacity to produce at least 1 million tons of binderless coal briquettes annually at the Buckskin Mine. Although the plant would be located on surface owned by the Buckskin Mine, and would purchase coal from the mine, it would be permitted and operated independently from the mine by White Energy Company and NRG Energy.
- *GreatPoint Energy and Peabody Coal.* These two companies entered into an agreement in January 2008, under which Peabody Coal would become the preferred provider of coal to GreatPoint Energy for use in a commercial-scale coal-to-gas conversion plant in the PRB.
- *Wyoming Infrastructure Authority.* The Wyoming Infrastructure Authority (WIA) was created in 2004 by the Wyoming State Legislature. It was tasked with promoting the state's economic development by assisting in the development of interstate electric transmission infrastructure. In 2006, WIA's role was expanded to also promote advanced coal technologies related to electric generation (Wyoming Infrastructure Authority 2008a). In

2007, WIA selected PacifiCorp from a list of 17 candidate firms and entered into a public-private partnership to assess the feasibility of developing an integrated gasification combined cycle power plant. The initial study focused on a site in southwestern Wyoming, but may open the way for similar projects elsewhere in the state (Wyoming Infrastructure Authority 2008a), including the PRB.

- Additionally, there is a developing technology that would use existing oil and gas wells to generate biologically formed methane by enhancing the methane production from naturally occurring microbes in the coal. This process is proposed for commercial testing. It is a hybrid between conventional in-situ coal gasification and conventional CBNG development. A policy to authorize and regulate this activity is currently being developed by the Department of the Interior.

Carbon Sequestration

Carbon sequestration, the process of carbon capture, separation, and storage or reuse, is being researched as a means to stabilize and reduce concentrations of CO_2 (a GHG). Direct options for carbon sequestration would involve means to capture CO_2 at the source (e.g., power plant) before it enters the atmosphere coupled with "value-added" sequestration (e.g., use of captured CO_2 in enhanced oil recovery [EOR] operations). Indirect sequestration would involve means of integrating fossil fuel production and use with terrestrial sequestration and enhanced ocean storage of carbon.

No carbon sequestration projects currently exist in the Wyoming PRB study area. However, CO_2 is being injected underground for the purpose of EOR near that study area in the Salt Creek area.

The 59th Session of the Wyoming State Legislature passed, and Governor Freudenthal signed into law, legislation that could affect long-term energy-related development in the PRB (House Bills 0089 and 0090) (Wyoming Legislative Services 2008). The former (now part of Wyoming Statute 34-1) specified the ownership of subsurface "pore" space, established the rights to use such space for the purpose of carbon sequestration, and maintained the primacy of the mineral estate and the owners of such estate to reasonable use of the surface for the purpose of mineral exploration and production.

Legal provisions enacted as a result of House Bill 0090 vested regulatory control over carbon sequestration with WDEQ and directed the department to promulgate rules, regulations (including permitting processes), and standards for such use. The legislation also specifies that applications for a carbon sequestration project must describe the geology of the area, aquifers above and below the intended injection zone, drill holes and operating wells in the area, potential impacts on other fluid resources, and identify a program for detecting migration or excursion of the CO_2. Finally, the enacted legislation (Wyoming Statute 35-11-103) specifically states that the act is not intended to impede or impair the rights of oil and gas operators to inject CO_2 through an approved EOR project and establish, verify, register, and sell emissions reduction credits.

Based on the coal-related and oil- and gas-related development in the PRB study area, the potential exists for future development of carbon sequestration in the area. However, no commercial projects specifically targeted at capturing and sequestering carbon have been

identified at this time. Sequestration was not included in the PRB Coal Review analysis because the likelihood of projects occurring was not known when the analysis was conducted.

Table 4-5 is a summary of past, present, and reasonably foreseeable coal mines, coal-related facilities, coal production, coal mine employment, and coal and coal-related disturbance in the Wyoming PRB.

Table 4-5. Past, Present, and Projected Wyoming PRB Coal Mine and Coal-Related Development Scenario

Year	Coal Production (million tons per year)	Number of Active Coal Mines[a]	Number of Active Power Plants	Number of Active Coal Conversion Facilities[b]	Direct Coal Mine Employment	Total Coal Disturbance (acres)[c]
Past and Present						
1990	163	18	3	1	2,862	N/A
1995	247	19	4	1	3,177	N/A
2000	323	12	4	2	3,335	N/A
2003	364	12	4	0	4,697	68,794
2007	428	13	5	0	5,533	83,593
Projected Development—Lower Coal Production Scenario						
2010	411	131	7	12	5,433	98,662
2015	467	131	7	12	5,705	117,236
2020	495	131	7	12	5,731	137,443
Projected Development—Upper Coal Production Scenario						
2010	479	131	7	12	5,509	102,448
2015	543	131	7	12	5,722	124,545
2020	576	131	8	12	5,998	149,089

N/A = Not Available

[a] Mines have consolidated and may continue to do so in the future. Also, new mines may be permitted to better access the coal reserves projected for mining by 2020.

[b] Several coal conversion facilities currently are being evaluated; however, there is only one for which the likelihood of future development currently can be assessed.

[c] Disturbance area includes coal mine and coal-related disturbance areas.

Source: Annual Report of the Wyoming State Mine Inspector (Wyoming Department of Employment 1990, 1995, 2000, 2003, and 2007a) and Updated Task 2 Report (BLM 2009c).

4.1.2 Oil and Gas Development

The following information on existing conventional and CBNG development is summarized from the updated Task 2 Report (BLM 2009c). The information reported is for 2003, which was the baseline year for the coal review.

4.1.2.1 Conventional Oil and Gas

Conventional oil and gas development includes all non-CBNG development activity. Approximately 1,500 conventional oil and gas wells, including producing, non-producing, and injection wells, were drilled between 1990 and 2003 (IHS Energy Services 2004) in the Task 2 study area. Of those, 60% were development wells drilled in established producing areas. The remaining 40% were classified as wildcat wells, which are wells that are drilled in non-producing areas or drilled to evaluate untested prospective zones in producing areas. Approximately 75% of the wildcat wells were plugged and abandoned. By 2003, the successful new field wildcat wells had resulted in the discovery of 61 new fields that produced 719,000 barrels of oil and 1.45 billion cubic feet of non-CBNG (Wyoming Oil and Gas Conservation Commission 2004).

As of the end of 2003, approximately 3,500 producing conventional oil and gas wells were in the Wyoming PRB study area plus 1,386 seasonally active wells (IHS Energy Services 2004). The WOGCC reported that these wells produced approximately 13 million barrels of oil and 41 billion cubic feet of conventional gas in 2003 (Wyoming Oil and Gas Conservation Commission 2004). The USGS (2002a) estimated that the mean undiscovered noncoal bed hydrocarbon resource in the PRB (including Montana) is 1.8 billion barrels of oil equivalent.

By the end of 2007, there were approximately 3,857 producing conventional oil and gas wells in the Wyoming PRB study area plus an estimated 1,500 seasonally active wells (IHS Energy Services 2008). WOGCC reported that these wells produced approximately 11.4 million barrels of oil and 22 billion cubic feet of conventional gas in 2007 (Wyoming Oil and Gas Conservation Commission 2008c).

Most of Wyoming's current oil production is from old oil fields with declining production, and the level of exploration drilling to discover new fields has been low (Wyoming State Geological Survey 2002). This situation is reflected in the PRB where, over the 10-year period from 1992 through 2002, oil production from conventional oil and gas wells in Campbell and Converse counties decreased approximately 60.4% (from 32.8 million barrels in 1992 to 13.0 million barrels in 2002). Oil prices have been increasing, which is reversing projections of a continuing decline in oil and gas production. Thus, production is now expected to increase in the PRB, with a peak around 2010 of approximately 15.7 million barrels (WSO-RMG 2005). Oil production in the short term may also be bolstered by some planned CO_2 flood projects in the PRB (Wyoming State Geological Survey 2003). This projected temporary upward trend in conventional oil and gas development is reflected in the PRB Coal Review projections (table 4-6).

Table 4-6. Actual Wyoming PRB Conventional Oil and Gas Development Scenario

	Actual	
Production and Wells	**2003**	**2007**
Annual Gas Production (billion cubic feet)	39.9	22.0
Annual Oil Production (million barrels)	12.9	11.4
Active Wells	5,067[a] 3,85	7[b]
Inactive Wells	1,994	0[c]

[a] Total includes approximately 1,500 seasonally active wells.

[b] Total includes approximately 1,500 seasonally active wells and an unknown number of inactive wells.

[c] Unknown.

Source: Updated Task 2 Report (BLM 2009c).

The active wells identified in table 4-6 include wells that produce year-round, seasonally producing wells, and service wells (mainly injection wells). It is estimated that there are approximately 2,000 idle conventional oil and gas wells in the PRB Coal Review study area (Wyoming Oil and Gas Conservation Commission 2008). However, the number of idle wells would gradually be reduced in the future through plugging programs, and the idle well locations (once the wells are abandoned) would be reclaimed, and would no longer represent a disturbance.

4.1.2.2 CBNG Development

Natural gas production has been increasing in Wyoming. In the PRB, this is because of the development of shallow CBNG resources. Commercial development of these resources began in limited areas west of and adjacent to the northernmost surface coal mines in the late 1980s. Since that time, CBNG development has spread south and west into other parts of the Task 1 and Task 2 study areas.

On private and state oil and gas leases, the WOGCC and the Wyoming State Engineer's Office (SEO) authorize CBNG drilling. On federal oil and gas leases, the BLM must analyze the individual and cumulative environmental impacts of all drilling (federal, state, and private), as required by NEPA, before CBNG drilling can be authorized. The BLM does not authorize drilling on state or private leases but must consider the impacts from those wells in their NEPA analyses. In many areas of the PRB, the coal estate is federally owned, but the oil and gas estate is privately owned. A June 7, 1999, Supreme Court decision (98-830) assigned the rights to develop CBNG on a piece of land to the owner of the oil and gas estate.

Annual CBNG production increased rapidly in the PRB between 1999 and 2003 but has leveled off somewhat since then. At the end of 2003, 14,758 producing CBNG wells were in the study area (IHS Energy Services 2004), and total production for 2003 was 346 billion cubic feet, or 88% of the total gas production from the PRB (Wyoming Oil and Gas Conservation Commission 2004). Total CBNG production in the PRB was 377 billion cubic feet for 2006, 432 billion cubic feet for 2007, and 536 billion cubic feet for 2008 (Wyoming Oil and Gas Conservation Commission 2009). Average daily CBNG production was about 947 million cubic feet per day in 2003 (Holcomb 2003), 1,033 in 2006, 1,177 in 2007, and 1,469 in 2008 (Wyoming Oil and Gas Conservation Commission 2009). From 1987 to 2003, the total cumulative gas production from PRB coals was over 1.2 trillion cubic feet. The total water production for the same period

was approximately 2.3 billion barrels (96,600 million gallons). According to the WOGCC website, water production in the PRB associated with CBNG production has ranged between just over 567 million barrels (23,814 million gallons), or about 1.6 million barrels per day, in 2003, and 679 million barrels, about 1.9 million barrels per day, since December 2003.

Since the early 1990s, the Wyoming BLM has completed numerous environmental assessments and two EISs analyzing CBNG projects. The most recent of these is the Final EIS and Proposed Plan Amendment for the PRB Oil and Gas Project, completed in January 2003 (BLM 2003). The level of CBNG development since 2003 appears to be lower than was forecast in that document. New CBNG well numbers fell from a high of slightly more than 4,600 in 2001 to approximately 2,000 in 2004. The updated Task 2 Report (BLM 2009c) discusses the uncertain trends for future CBNG activity in recent years. The methodology used to project future activity is detailed in appendix E of that report. Table 4-7 shows the baseline 2003, actual 2007, and projected 2010, 2015, and 2020 levels of CBNG development used to evaluate projected cumulative environmental impacts in the PRB Coal Review.

Table 4-7. Actual Wyoming PRB CBNG Development Scenario

Production and Wells	2003	2007
Annual Production (billion cubic feet)	338	432
Active Wells	14,758	20,408

Source: Updated Task 2 Report (BLM 2009c).

The amount of CBNG activity appears to be at a lower rate than was forecast by earlier projections in the Final EIS and Proposed Plan Amendment for the PRB Oil and Gas Project (BLM 2003), as well as in the 2005 Task 2 Report (BLM 2005b). New CBNG well numbers fell from a high of slightly more than 4,600 in 2001 to approximately 2,000 in 2004. It is anticipated that the number of new wells would increase so that between 2010 and 2020 the number of new wells drilled per year, basinwide, would range from 2,892 to 3,943. As shown in table 4-7, there would be 31,943 CBNG wells basinwide by 2010, considerably lower than the over 40,000 wells predicted for the same time period in the Final EIS and Proposed Plan Amendment for the PRB Oil and Gas Project (BLM 2003). It is anticipated that production in the cumulative effects study area would increase from the 432 billion cubic feet per year observed in 2007 to approximately 1,026 billion cubic feet per year in 2020. These estimates are relatively aggressive related to actual activity from 2003 to 2007 (BLM 2009c), and it is likely that the Buffalo RMP revision, currently underway, will further refine these estimates.

4.1.2.3 Oil- and Gas-Related Development

Oil- and gas-related development activities considered in the PRB Coal Review include major transportation pipelines and refineries. Table 4-8 summarizes the net disturbance, reclamation, and water production associated with oil and gas activity (conventional oil and gas, CBNG, and major transportation pipelines) for 2003 (baseline year) and projects disturbance, reclamation, and water production for future years.

Table 4-8. Wyoming PRB Conventional Oil and Gas, CBNG, and Related Development Disturbance and Water Production

Category	Actual		Projected		
	2003	2007	2010	2015	2020
Cumulative Disturbed Area (acres)[a] 177,	140	178,023	248,086	344,713	427,557
Cumulative Permanently Reclaimed Area (acres)	114,777	111,926	157,803	226,775	310,959
Cumulative Unreclaimed Area (acres)	62,363	66,097	90,283	117,959	116,598
Annual Water Production (million gallons per year)	26,405	31,738	50,865	71,166	72,047

[a] Inclusive of conventional oil and gas and CBNG activities and major transportation pipelines. Disturbance associated with ancillary facilities (including gathering lines and distribution power lines) has been factored in a per-well basis.

Source: Updated Task 2 Report (BLM 2009c).

Pipelines

Major transportation pipelines for the transport of oil and gas to outside markets are a key factor in the development of CBNG and conventional oil and gas resources in the Task 2 study area for the Wyoming portion of the PRB. Major transportation pipelines also provide for transport of CO_2 to crude oil well fields, which depend somewhat on the availability of CO_2 for EOR. Currently, there are more than 13 major transportation pipeline systems in the PRB that transport gas resources to markets outside of the PRB (Flores et al. 2001; Wyoming Pipeline Authority 2008). The current capacity of these pipeline systems is approximately 2.1 billion cubic feet per day. Currently, the combined natural gas production (CBNG and conventional gas) in the Wyoming PRB study area is approximately 1.22 billion cubic feet per day.

Gathering lines and power lines associated with conventional oil and gas and CBNG development also occur within the study area; disturbance from these ancillary facilities were factored into the PRB Coal Review analysis on a per-well basis.

Currently, there are two proposed natural gas transportation pipeline projects and one proposed EOR pipeline that would cross the PRB study area:

- Bison Pipeline LLC (Bison), wholly owned by a subsidiary of TransCanada Corporation, is proposing to construct the Bison Pipeline Project, an interstate natural gas pipeline designed to transport gas from the PRB to the Midwest market. The Bison project will consist of approximately 302 miles of 30-inch-diameter natural gas pipeline and related facilities that will extend from near Gillette through southeastern Montana and southwestern North Dakota where it will interconnect with the Northern Border Pipeline system in North Dakota. Approximately 53 miles of the proposed route is within the Wyoming PRB Coal Review study area. If constructed, the Bison project would have a capacity of 470 million cubic feet per day with potential to expand to approximately 1,000 million cubic feet per day. Bison filed an application with the Federal Energy Regulatory Commission (FERC) for a certificate of public convenience and necessity to construct, own and operate the pipeline in April 2009 with an in-service estimate of 2010 (Bison Pipeline 2009).
- The proposed Pathfinder Pipeline Project was a 42-inch-diameter, 500-mile-long natural gas pipeline that would cross the Wyoming PRB study area; however, its main supply of gas

would come from the Green River Basin, where it would originate. It is possible that an interconnect at Dead Horse Creek might provide an outlet for PRB-produced gas into Pathfinder. If constructed, the Pathfinder project would have had a 1.2 to 2.0 billion cubic feet per day capacity. TransCanada received a notice of pre-filing on the Pathfinder Project from FERC on June 4, 2008. TransCanada sent a letter to FERC asking that pre-filing activities be suspended on March 23, 2009. TransCanada has no record to indicate termination the Pathfinder docket (Dodson pers. comm.).

- Encore's proposed 231 mile CO_2 pipeline would extend from near Lysite, Wyoming, to the Belle Creek oil production field in Powder River County near Ridge, Montana. The Greencore pipeline would go through the PRB and transport CO_2 used for EOR and carbon sequestration. The pipeline construction is planned to start in the summer of 2011pending issuance of a federal right of way and surface owner consents. This project is considered to have a high likelihood of completion. Information on this project can be found by contacting the Wyoming Enhanced Oil Recovery Institute.

Beyond the Task 2 study area for the Wyoming PRB, the oil and gas pipeline projects essentially would parallel one another to interconnect with Northern Border's main pipeline in North Dakota. Since these projects would be interstate gas transportation pipelines, they would be regulated by the FERC. Although FERC lists these projects as "on the horizon" (Federal Energy Regulatory Commission 2008), no formal applications have been filed with the regulatory agencies (Federal Energy Regulatory Commission 2008; WDEQ 2008). Both of these projects are dependent upon acquisition of sufficient support in the open season process. Based on the lack of formal applications, their likelihood currently is considered low (BLM 2009c).

Currently proposed and construction-in-progress natural gas transportation pipeline projects would not cross the Wyoming PRB study area; however, they would influence the ability of PRB gas producers to access outside markets. These projects are the Alliance Pipeline (a 42-inch-diameter natural gas pipeline proposed from Wamsutter, Wyoming, to Emerson, Manitoba) and the Rockies Express (from Rio Blanco County, Colorado, to Monroe County, Ohio) (Rockies Express Pipeline LLC 2008; Wyoming Pipeline Authority 2008). The Alliance Pipeline is expected to commence construction in 2012, with a proposed in-service date sometime in 2013. Rockies Express Pipeline (western segment from western Colorado to Missouri) was in-service in January 2008. The expected in-service date for the eastern segment (Missouri to Ohio) is October 2011. Although important to PRB gas producers, because these projects would not cross the Wyoming PRB study area, they are not considered further in this analysis.

The amount of available pipeline capacity could limit the amount of future CBNG development. In the 2005 Task 2 Report (BLM 2005b), it was estimated that growth of Wyoming PRB CBNG production could rise from the 2003 level of 947 million cubic feet per day up to 3 to 4 billion cubic feet per day around 2007 and remain at or above those levels until 2015 (Holcomb 2003). However, production rates of 3 to 4 billion cubic feet per day were not realized by 2007, and the average daily production for all gas (conventional and CBNG) was approximately 1.22 billion cubic feet per day (Wyoming Oil and Gas Conservation Commission 2008). Average CBNG production in 2007 was approximately 1.24 billion cubic feet per day. The addition of the Bison Pipeline Project would increase the take-away capacity of the PRB by approximately 0.5 billion cubic feet per day, resulting in total take-away capacity for the PRB of approximately 2.55 billion cubic feet per day. The addition of the Pathfinder Pipeline Project would increase the

take-away capacity by approximately an additional 1.6 billion cubic feet per day, for a total of approximately 4.15 billion cubic feet per day. Based on the assumptions in the updated Task 2 Report (BLM 2009c), the projected total gas production (conventional and CBNG) would increase to 2.06 billion cubic feet per day in 2010, 2.86 billion cubic feet per day in 2015, and 2.91 billion cubic feet per day in 2020. Therefore, likelihood for additional new pipeline construction for 2010 is low, with a higher likelihood in subsequent years (BLM 2009c).

In the 2005 Task 2 Report (BLM 2005b), it was indicated that Anadarko Petroleum Corporation was planning to extend its CO_2 pipeline that runs between Bairoil, Wyoming, and Salt Creek, Wyoming, to the Sussex Field located in the southern Johnson County portion of the Wyoming PRB study area. However, more recent information indicates that this has not occurred (Anadarko Petroleum Corporation 2008). According to the Wyoming Enhanced Oil Recovery Institute, fields in the Wyoming PRB study area that would be good candidates for EOR using CO_2 include Hartzog Draw, Hilight, and House Creek (Boyles and vant Veld 2006). Laterals from the Greencore Pipeline could be constructed in the future to carry CO_2 to potential oil recovery projects in the Wyoming portion of the PRB; however, no projects are currently planned. The 2005 Task 2 Report (BLM 2005b) projected that basinwide production of CBNG could double by 2020, which would suggest that additional pipelines could be built. The recent update of the that report (BLM 2009c) revised the projections. As noted in Section 4.1, trends in CBNG development since 2007 indicate that this estimate may be lowered as new forecasting is done. Current gas pipeline capacity out of the PRB is approximately 2.05 billion cubic feet per day; average conventional natural gas and CBNG production in 2007 was approximately 1.24 billion cubic feet per day. Based on the information in the updated Task 2 Report (BLM 2009c), potential total gas production (conventional natural gas and CBNG) has been projected at 2.06 billion cubic feet per day by 2010. This potential is pipeline capacity limited, suggesting additional pipelines could be built.

Refineries

Construction of a new refinery was completed in the Wyoming PRB study area in 2008. The NorthCut Refinery, owned and operated by Interline Resources, is located in Converse County, approximately 20 miles north of the town of Douglas, Wyoming. Construction of the refinery, which was a conversion of the previously existing Well Draw Gas Plant, included installation of a crude oil pipeline between the company's existing crude gathering system and the refinery.

The NorthCut Refinery is a crude oil topping plant, specifically engineered to process 4,000 barrels per day of sweet crude produced in the PRB. Output from the refinery will include naptha, off-road diesel, and reduced crude oil. The markets for the products include ethanol manufacturers, mines, and other refineries. The company-owned crude oil pipeline and third-party tanker trucks will be used for delivery of crude stocks. Tanker trucks also will be used to transport finished products from the facility (Interline Resources 2008).

The refinery is adjacent to and east of Wyoming 59, with the joint BNSF and UP rail line located just to the west of the highway. The site previously had been the location of the Well Draw Gas Plant (approximately 20 acres), which shut down in 2002 following a fire. Interline has acquired an additional 12 acres bordering the original site for administrative, maintenance, and transportation-related uses (Interline Resources 2008).

The level and composition of outputs from the existing NorthCut Refinery would respond to various markets, potentially resulting in the construction of additional infrastructure and/or facilities in the future. Any future changes and associated disturbances would occur within the property currently owned by Interline Resources at the NorthCut site (Williams pers. comm.). Currently, no specific plans for expansion have been identified. As a result, the likelihood for project expansion currently is considered speculative. Therefore, it has been eliminated from further analysis in this study.

No other reasonably foreseeable plans for construction and operation of new petroleum refineries in the Wyoming portion of the PRB have been identified.

4.1.3 Other Development Activity

4.1.3.1 Other Mining

Uranium, sand, gravel, bentonite, and clinker (or scoria) have been and are being mined in the Wyoming PRB study area.

Wyoming has been the nation's leading producer of uranium ore since 1995, and also hosts the nation's largest uranium reserves (Wyoming State Geological Survey 2009). There are three primary uranium mining districts in the PRB: Pumpkin Buttes, Southern Powder River, and Kaycee (BLM 2003). Numerous uranium mining sites, both potential and existing, are present in these districts. Wyoming's only currently producing uranium mines are the Smith Ranch-Highland operation and the Christensen Ranch operation. The Smith Ranch-Highland operation is located in Converse County in the Southern Powder River District, and the Christensen Ranch operation is located in Johnson and Campbell counties in the Pumpkin Buttes area. The Smith Ranch-Highland operation is owned by Power Resources, Inc. (dba Cameco) and uses the in-situ recovery (or in-situ leach) method of mining. Aside from the Smith Ranch-Highland operation, the only other uranium mining operation in the PRB that is currently licensed by the U.S. Nuclear Regulatory Commission (NRC) is the Christensen Ranch/Irigaray operation (owned by COGEMA Mining, Inc.) located in Johnson and Campbell counties (U.S. Nuclear Regulatory Commission 2009).

In the 2005 Task 2 Report (BLM 2005b), reasonably foreseeable uranium development was eliminated from further consideration because: 1) there were no specific projects with pending applications and 2) no development was anticipated, based on market conditions. Based on commodity forecasts and uranium activity as of June 2004, the likelihood and potential timing of new uranium mining operations in the PRB was not known, and additional development was not projected in the PRB Coal Review analysis. Because of increased overall demand for energy in recent years, uranium prices have increased from a low of $7 a pound in 2001 to over $138 a pound in 2007 (Barry 2008). The price fell to $62 in 2008 and is currently in a range of $40 to $50 per pound, which is expected to hold through 2010 because of stable demand and a growing supply. The recent upsurge in yellowcake spot prices has increased exploration and claim-staking activity in the PRB and is generating considerable interest in new development (Wyoming State Geological Survey 2009).

In response to the increased price of uranium, a number of uranium mine developments currently are proposed in the Wyoming PRB study area. The NRC is currently reviewing applications for

two new uranium recover facilities in the PRB: the Moore Ranch and the Nichols Ranch-Hank Unit (U.S. Nuclear Regulatory Commission 2009). The Moore Ranch, owned by Energy Minerals Corporation (dba Uranium One), is located in Converse County, and the Nichols Ranch-Hank Unit, owned by Uranerz Energy Corporation, is located in Campbell and Johnson counties. Both of these projects submitted license applications in 2007, they are located in the Pumpkin Buttes District, and would use the in-situ recovery method of mining.

Over the next three years, the NRC expects to receive additional applications for new uranium recovery facilities, as well as requests for restarts and expansions of existing facilities. Table 4-9 provides information on the three new projects and four expansion projects currently proposed in the PRB, all of which would use in-situ recovery. With the exception of the Ross Project, which is located in western Crook County, the proposed developments are all in the Pumpkin Buttes District in southwestern Campbell and northwestern Converse counties. The actual number of the proposed developments that would become operational would depend on several factors including uranium prices and approval of permits.

Table 4-9. In-Situ Recovery Uranium Projects Currently Proposed in the Task 2 Study Area for the Wyoming portion of the PRB

Project/Company	County	Application Type	Watershed/Mining District	Likelihood/Rationale
Ludeman Satellite Project/Energy Metals Corp (dba Uranium One)	Converse Ex	pansion/Amend ment to Moore Ranch	Antelope Creek/Pumpkin Buttes District	Moderate for 2012/Letter of intent to NRC February 2009, application expected 2009.
Allemand-Ross Satellite Project/Energy Metals Corp (dba Uranium One)	Converse Ex	pansion/Amend ment to Moore Ranch	Antelope Creek/Pumpkin Buttes District	Moderate for 2012/Letter of intent to NRC February 2009, application expected 2009.
Ross Project/Peninsula Minerals, Ltd.	Crook	New	Little Missouri River/not in one of the three districts	Moderate for 2012/Letter of intent to NRC October 2009, application expected 2010.
Collins Draw Project/Uranerz Energy Corporation	Campbell New		Powder River/Pumpkin Buttes District	Moderate for 2012/Letter of intent to NRC March 2008, application expected 2009.
North Butte-Ruth Project/Power Resources, Inc. (dba Cameco)	Campbell and Johnson	Expansion/Satellit e to Smith Ranch	Powder River/Pumpkin Buttes District	High probability for 2012/Application for commercial operation filed March 2006.
Reno Creek Project/Bayswater Uranium Corporation	Campbell	New	Belle Fourche River and Antelope Creek/Pumpkin Buttes District	Moderate for 2015/Letter of intent to NRC March 2009, application expected 2010.
Ruby Ranch Project/Power Resources, Inc. (dba Cameco)	Campbell Ex	pansion/Satellit e to Smith Ranch	Powder River and Belle Fourche River/Pumpkin Buttes District	Moderate for 2015/Letter of intent to NRC March 2008, application expected 2009.

NRC = U.S. Nuclear Regulatory Commission

Sources: U.S. Nuclear Regulatory Commission (2009), World Information Service on Energy (2009).

Bentonite is weathered volcanic ash that is used in a variety of products, including drilling mud and cat litter, because of its absorbent properties. There are three major bentonite producing districts in and around the PRB: the Colony District in the Northern Black Hills, the Clay Spur District in the Southern Black Hills, and the Kaycee District west of Kaycee, Wyoming. Within the PRB Coal Review study area, bentonite is mined at Kaycee (Wyoming Mining Association 2006). The PRB Coal Review assumed that bentonite mining would continue throughout the study period and that production would continue at existing active mines, with no new mines developed through 2020.

Aggregate (i.e., sand, gravel, and stone) is used for construction purposes. In the PRB, the more important aggregate mining localities are in Johnson and Sheridan counties (Wyoming State Geological Survey 2004). The largest identified aggregate operation is located in northern Converse County. It has an associated total disturbance area of approximately 67 acres, of which 4 acres have been reclaimed.

Clinker (known locally as scoria or red dog), which is formed when coal beds burn and the adjacent rocks become baked, is used as aggregate where alluvial terrace gravel or in-place granite/igneous rock is not available. Clinker generally is mined in Converse and Campbell counties in the Wyoming PRB study area.

Increased sand, gravel, and clinker production and associated surface disturbance are anticipated in the Wyoming PRB study area in the future because aggregate would be required for road maintenance and new construction activities as other primary resources, such as coal and oil and gas, continue to be developed. New operations and increased production from existing operations can be expected. These operations would vary in size based on the immediate need from the primary industries, but there is no specific information about these projected operations. As a result, new sand, gravel, or clinker operations were not analyzed in detail in the PRB Coal Review.

4.1.3.2 Industrial Manufacturing

A number of existing industrial manufacturing establishments are located in the Wyoming PRB Coal Review study area. Most are relatively small with fewer than 25 employees; they predominately serve regional and local markets, and most are directly or indirectly related to energy resource development and production. Over the years, some of these firms have expanded such that they now support activities and serve markets outside of the region, but those operations remain dependent upon the local and regional markets to sustain their existing operations.

The PRB Coal Review anticipates that increased coal production would result in an increased demand for fuels and explosives. This increased demand could result in the need for the development of new off-site chemical feedstock plants in the study area. Project-specific information is not available; however, and the potential development of new chemical feedstock plants was not considered in the PRB Coal Review.

Local economic development organizations, including Campbell County Economic Development Corporation and Converse Area New Development Organization, are continually engaged in efforts to recruit or assist new business formation in the PRB study area. For example, the latter has pursued development of long-term potential projects; however, the

outcomes of those projects are uncertain and little information and detail are available. As a result, they were not considered in the PRB Coal Review.

4.1.3.3 Wind Power

Because of increasing concerns over global climate change, there is strong interest from consumers, investor-owned utilities, and environmental and economic sustainability interests in wind energy generating projects and other forms of renewable energy projects. The current development interest in wind energy generation is driven in part by mandates for many utilities to increase the use of renewables in their overall energy portfolio, decisions by environmentally conscious firms to use renewable energy sources, and also because of the development of wind energy manufacturing infrastructure in the region.

Wind power facilities have been proposed, are being constructed, and are providing energy at various sites in Wyoming, including the PRB. There is good potential for wind power, and these facilities can contribute to meeting forecasted electric power demands; however, they are dependent on available transmission capacity to send power to users. Among the lower 48 states, Wyoming currently ranks in eleventh place in terms of existing wind power capacity with 986 MW currently in operation and 299 MW under construction. Texas ranks in first place with 8,797 MW in operation and 660 MW under construction. In terms of annual wind energy potential, Wyoming ranks seventh with 747 billion kilowatt-hours per year. North Dakota ranks first with 1,210 billion kilowatt-hours per year (American Wind Energy Association 2010). Although many Wyoming locations having the highest potential are in the southern portion of the state, areas in both Converse and Campbell counties offer sufficient potential to support commercial-scale wind generation projects.

- One such project, the Glenrock Wind Farm, is currently providing power in the Wyoming PRB study area. PacifiCorp completed construction of this three-phase project in Converse County in 2009. The Glenrock Wind Farm is located approximately 15 miles north of the existing Dave Johnston Power Plant, on and near the site of the former Dave Johnston Coal Mine. This is the first wind energy project in the nation to be located at a reclaimed coal mine. The first phase, known as the Glenrock Wind Energy Project, went online in 2008. The second and third phases, the Rolling Hills Wind Energy Project and the Glenrock III Wind Energy Project, respectively, went online in 2009. The Glenrock and Rolling Hills phases each consist of 66 wind turbine generators (each rated at 1.5 MW [99 MW total]). The Glenrock III phase consists of 26, 1.5-MW wind turbines (39 MW total) (PacifiCorp 2009).
- Duke Energy (dba Three Buttes Windpower, LLC) completed the Campbell Hill Windpower Project and began commercial operations in December 2009. The Campbell Hill Windpower Project is located approximately 15 miles northeast of Casper in Converse County and consists of 66 wind turbines generating 99 MW. PacifiCorp will buy all of the output generated by the project.
- Duke Energy plans to build the Top of the World Wind Energy Project, a 200-MW wind farm located northeast of Glenrock in Converse County. Construction was expected to begin in early 2010 upon receipt of all necessary permits from the state. PacifiCorp will buy the power generated by the project (Duke Energy 2009).

- Third Planet Windpower is in the initial development phase of a wind energy project (Reno Junction Windfarm) in the Pumpkin Buttes area of southwestern Campbell County. Third Planet Windpower has acquired approximately 13,000 acres of land leases for the project, installed meteorological monitoring sites, and is currently doing environmental and feasibility studies. The company plans to install up to 133, 1.5-MW towers, yielding a total capacity of 200-MW, if fully constructed. The site for the Reno Junction Wind Farm is close to the Black Hills Power Pumpkin Buttes substation and the companies are seeking an agreement for interconnection. Construction was expected to begin in mid-2010, with an online date anticipated for the end of 2010 (Rogers 2008). This project is considered moderately likely to occur (BLM 2009c).

Land use disturbance for wind energy projects is associated with development of access roads, a turbine assembly pad, and foundation pad for each wind turbine tower. Additional land disturbance results from installation of transformers and substations, underground electric and fiber optic communications cables, one or more operations and maintenance facilities, meteorological towers, and a transmission line connecting the project to the regional grid. Much of the disturbance area is reclaimed immediately following construction, with long-term disturbance associated with permanent facilities (i.e., access roads, support facilities, and tower foundations).

Wind generating projects have an expected life of approximately 25 years, which could be extended based on market conditions and the overall condition of the infrastructure. Some redisturbance would occur at the time of decommissioning, followed by final reclamation.

According to the American Wind Energy Association (2010), transmission will be a key issue for the wind industry's future development over the next two decades.

4.1.3.4 Solar Power

Although Wyoming has been given a rating of 5,000 to 5,500 watt hours per square meter per day solar resource for flat plate collectors, currently, no utility-scale solar power collection facilities are located on federal, state, or private lands in Wyoming. Furthermore, no applications for the development of utility-scale solar energy projects had been filed as of June1, 2011.

The BLM, the Office of Energy Efficiency and Renewable Energy, and the DOE are jointly preparing a solar energy programmatic EIS which could facilitate future solar energy development application processes. Wyoming is not covered in the programmatic EIS but still may be affected by it. Information on the programmatic EIS can be found at: http://solareis.anl.gov. The BLM currently evaluates solar energy project proposals on a case-by-case basis.

Solar energy use in Wyoming is, as of January 1, 2010, limited to private residences and private commercial establishments. Current Wyoming solar energy incentives include a sales tax rebate on industrial or commercial solar energy generation equipment, a one-time grant of up to $3,000 offered through lottery from the Wyoming Business Council, and the utility buy back of unused electricity at the wholesale price. Solar energy production equipment and installation at residential, commercial, and utility sites is expensive. Currently, the electric utility costs in Wyoming are such that the cost of installation does not favor solar energy development over existing forms of energy development.

4.1.3.5 Reservoirs

Currently, five key water storage reservoirs are present in the Wyoming PRB Coal Review study area: Healy, Lake DeSmet, Muddy Guard No. 2, Gillette, and Betty No. 1 (HKM Engineering et al. 2002a and 2002b). The total surface disturbance associated with these water storage areas is 3,263 acres.

Based on the applicable water plans prepared for the Wyoming Water Development Commission for its Basin Planning Program (HKM Engineering et al. 2002a and 2002b), there are long-range projections for development of additional reservoirs in the Wyoming PRB study area. However, none of these reservoirs have reached the planning stage; therefore, there was not enough information to analyze them in the PRB Coal Review.

4.1.3.6 Other Non-Energy Development

In addition to the specific projects and developments described above, a network of public and private physical infrastructure, private enterprises, and public activities has been developed in the PRB over time. Examples of infrastructure include the highway and road networks, airports, government offices, hospitals, public schools, municipal water systems, and extensive residential and commercial real estate development. Private enterprises include local retail and service establishments, newspaper publishing, and transportation and distribution firms.

There are a number of existing industrial manufacturing and service establishments located in the Wyoming PRB study area. Most are relatively small with fewer than 50 employees, and most serve local and regional markets, the majority of which are directly or indirectly related to energy resource development and production. Hettinger Welding and L&H Welding and Machine, both based in Gillette, are the largest industrial manufacturing firms in the region specializing in repairs, rebuilding, and manufacturing for the mining industry. Though classified as wholesalers and repair establishments, rather than as manufactures, firms such as Wyoming Machinery and P&H Mining Equipment also serve the mining and oil and gas industries. Other industrial manufacturing and service establishments in the region provide metal fabrication, metal plating, custom and precast concrete products, and specialized chemical products and services. Over the years, some of these firms have expanded such that they now support activities and serve markets outside the PRB region. However, they remain dependent upon the local and regional markets to sustain their existing operations (BLM 2009c).

Local economic development organizations, including Campbell County Economic Development Corporation and Converse Area New Development Organization are continually engaged in efforts to recruit or assist new business formation in the PRB study area. For example, the Converse Area New Development Organization is pursuing development of an ammonium nitrate plant (using methane as a feedstock) in the Bill, Wyoming, area, as well as location of an aluminum mill in the same general location. These and similar prospects are long-term potential whose outcomes are uncertain and for which little information and detail are available. As a result, they were eliminated from analysis in the PRB Coal Review (BLM 2009c).

Local governments, school districts, and other special service districts and public entities continually engage in long-term planning. Examples of some of the recently completed projects and developments, as well as anticipated plans or proposals for development in public, private,

and commercial infrastructure in the City of Gillette and Campbell County, are included in the current City of Gillette development summary (City of Gillette 2009) and are summarized below.

- The City of Gillette's Wastewater Treatment Plant was upgraded in 2007.
- An expansion and renovation of the county courthouse were completed in 2006, and a new public health building was completed in 2007.
- The Wyoming Center, a conference and multi-event facility expansion of the Gillette CAM-PLEX, was completed in 2008 annual. The expansion includes more exhibit space, conference and indoor athletic facilities with seating for up to 9,000, an indoor ice rink, and various concession and support spaces.
- A new $10 million headquarters for the Campbell County Fire Department providing administrative, training, storage space, and additional parking bays for firefighting equipment and vehicles was completed in 2008.
- A new Hospice Center, the Cummins Diesel Service Center, and the Hillcrest School were completed in 2008.
- Construction of the new Health Sciences Center at Gillette College was competed in 2008. The facility houses the school's nursing program, providing classrooms, labs, faculty offices, and other spaces. The nursing program functions in conjunction with the Campbell County Memorial Hospital
- Major infrastructure projects within and adjacent to the city limits in 2008 and 2009 included highway and roadway improvements, drainage system improvements, library renovations, subdivision developments, and expansion of the county landfill.
- Expansion of the Campbell County Detention Center and remodeling of the Sheriff's Office were completed in 2009.
- Construction of various commercial and residential housing developments is ongoing.
- The new $55 million Campbell County Recreation Center was completed and opened in April 2010.
- The county, city, and Gillette College are partnering on a Campus Housing Complex and the Industrial Technical Education Center. Construction of these facilities is ongoing and part of a long-range master plan for the college that is designed to provide a broad college-level curriculum and provide more focused education and training to support local business and industry. The 100-bed Gillette College Student Housing project was completed and opened for use in September 2009. The $55 million, 97,700-square foot Technical Education Center opened in January 2010.
- Campbell County Memorial Hospital is undergoing a major expansion and renovation project that began in 2009 and is expected to be completed in 2011.
- The new Hillcrest Elementary School in Gillette has been completed and opened in September 2009.
- The Burma Road extension is under construction. It will provide a north-south route across I-90 connecting the hospital area with Lakeway Road. This will improve traffic flow, and

open up more land for future development. The section across I-90 opened in August 2010 with full completion of the project projected for spring 2011.

- The City of Gillette is seeking state and local funding to construct an additional municipal water supply. Construction of a second Madison Formation well field in Crook County near the Keyhole Reservoir and a second water supply line from the well field to Gillette is expected to begin in 2011 or 2012.
- The Wyoming School Facilities Commission oversees all aspects of construction and maintenance of school facilities and physical plant. School districts submit five-year plans for facilities spending, which are subject to approval and funding by the commission. Currently approved master plans for the seven school districts serving some portion of the Wyoming PRB study area include defined needs for more than $115 million in capital construction, some of which have already been funded; the total includes approximately $51 million for the Campbell County School District, the bulk of which would fund three new elementary schools and one new high school (Wyoming School Facilities Commission 2008).

Additional private sector industrial and commercial development is expected to occur within the context of normal community and economic development. The strong economic base provided by the coal mines, oil and gas companies, and relatively high income of residents draws regional and national retailers (e.g., The Home Depot) to the area. Gillette's location on I-90 and the strong demand for lodging by energy workers, travelers, and visitors associated with events at the CAM-PLEX also have spurred construction of several new motels (Campbell County Economic Development Corporation 2008; City of Gillette 2008a).

- The 2010 Wyoming Department of Transportation State Transportation Improvement Program includes planned construction for the 2010 fiscal year and preliminary engineering estimates for projects with anticipated construction dates through 2015. In general, Wyoming transportation projects scheduled over the next six years include maintenance, reconstruction, and improvement projects. Airport improvement plans consist primarily of pavement rehabilitation and overlays, with some minor expansion of taxiways, aprons, and parking. Costs anticipated for 2010 through 2015 for highway and airport maintenance, reconstruction, and improvement projects in the PRB Coal Review study area (Sheridan, Johnson and Campbell counties) are approximately $190 million. No construction of new highways is scheduled, and no new airports are proposed.
- In addition to highway projects included in Wyoming Department of Transportation's 2008–2013 plan, the Eagle Butte Mine received approval from WYDOT to relocate a portion of U.S. Highway 14-16 in the vicinity of the Gillette–Campbell County Airport, north of the city of Gillette. The relocation will facilitate the recovery of approximately 40 million tons of additional coal recently acquired by the mine through the West Eagle Butte West LBA tract coal sale. Three alternative alignments, involving the construction of up to 6.8 centerline miles of new roadway, were identified and a preferred alternative was subsequently chosen and approved by the department. Construction of the new highway segment is anticipated in 2011/2012 (Wyoming Department of Transportation and Foundation Coal Company 2008).

There are numerous current and anticipated plans for future investment in public and private infrastructure in the PRB. Such investments would include state and local investment in transportation, administrative, and educational facilities. Given the timing, scale, year-to-year variability, relatively short construction timetables associated with such investments, the existence of a relatively large and diversified construction industry in the region and nearby areas, and the limited potential for these projects to alter long-term conditions in the PRB, they are not included in the PRB Coal Review analysis. However, one or more of these and similar projects could warrant consideration in a cumulative analysis for a site-specific project because of proximity or coincidental project schedules and timetables (BLM 2009c).

4.2 Affected Environment and Cumulative Environmental Consequences

This section summarizes the existing conditions based on the results of the Task 1 Report and the cumulative environmental consequences of projected development for 2010, 2015, and 2020, based on the Task 3 report.

As discussed in section 4.0, the Wyoming portion of the PRB is the primary focus of the PRB Coal Review analyses. For the majority of resources in the Task 1 analysis, the Wyoming PRB Coal Review study area encompasses all of Campbell County, all of Sheridan and Johnson counties outside of the Bighorn National Forest, and the northern portion of Converse County (map 4-1). The study areas for the Task 3 analyses are different. For the majority of the resources considered in the PRB Coal Review, the Task 3 study area is based on watershed boundaries in the PRB and includes the portions of the Upper Powder River, Little Powder River, Upper Belle Fourche River, Upper Cheyenne River, Antelope Creek, and Dry Fork Cheyenne River subwatersheds that lie within Sheridan, Johnson, Campbell and northern Converse counties (map 4-2). This analysis region includes over 4 million acres and is referred to below as the Task 3 study area. Table 4-10 summarizes the total disturbance and reclamation acreages for the 2003 baseline, 2007 actual, and the total projected disturbance and reclamation acreages for 2010, 2015, and 2020 in the Task 3 study area.

A total of approximately 210,096 acres (5%) within the Task 3 study area had been disturbed by cumulative development activities as of 2003. Based on the information presented in Appendices A and D of the updated Task 2 Report (BLM 2009c), approximately 222,568 acres (5%) had been disturbed by development activities by the end of 2007. Of those 222,568 acres of cumulative disturbance, approximately 83,593 acres (38%) were associated with coal mine development.

Of the 222,568 total acres of actual cumulative disturbance documented through 2007, approximately 113,382 acres (51%) have been reclaimed. The remaining 109,186 acres of disturbance would be reclaimed incrementally or following a project's completion, depending on the type of development activity and permit requirements.

Table 4-10. Actual and Projected Wyoming PRB Total Development Scenario, Task 3 Study Area

Year	Total Acres Disturbed	Total Acres Reclaimed	Acres Unreclaimed	Acres Unavailable for Reclamation[a]	Acres Affected by Coal Development[a]
Actual					
2003 210,	096	111,879	98,217	24,097	68,794
2007 222,	568	113,382	109,186	24,338	83,593
Projected Development—Lower Coal Production Scenario					
2010 278,	209	159,291	118,918	26,338	98,662
2015 354,	148	219,816	134,332	27,549	117,236
2020 422,	727	289,937	132,790	28,797	137,443
Projected Development—Upper Coal Production Scenario					
2010 281,	996	161,124	120,872	25,688	102,448
2015 361,	456	224,024	137,432	27,099	124,545
2020 576,	646	397,155	179,491	28,345	149,089

[a] Includes coal mine and coal-related disturbance; those acres will be reclaimed when mine operations end.

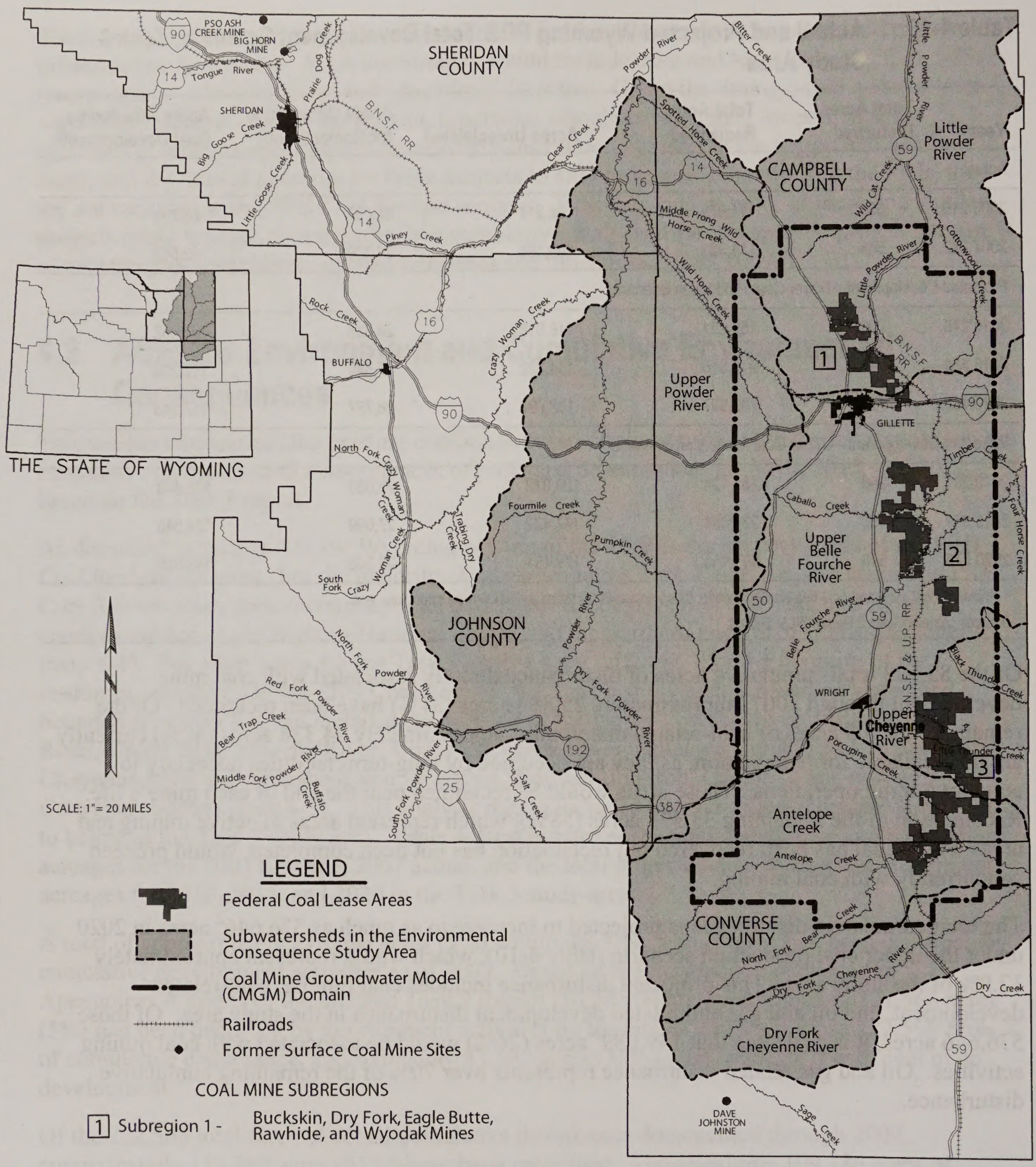
Source: Updated Task 2 Report (BLM 2009c).

Of the 83,593 total cumulative acres of disturbance directly associated with coal mine development through 2007, approximately 25,884 acres (31%) have been reclaimed. Of the remaining 57,709 acres of coal-related disturbance, approximately 24,338 acres (42%) currently are not available for reclamation, as they are occupied by long-term facilities necessary to conduct mining operations. These areas would be reclaimed near the end of each mine's life. Reclamation of the remaining 33,371 acres (58%), which represent areas of active mining and areas where coal has been recovered but reclamation has not been completed, would proceed concurrently with coal mining.

The total cumulative disturbance is projected to increase to as much as 576,646[2] acres in 2020 under the upper coal production scenario (table 4-10), which would represent approximately 12.9% of the study area. This projected disturbance includes coal mining, coal-related development, and oil and gas and related development disturbance in the study area. Of those 576,646 acres, it is projected that 149,089[3] acres (26%) would be associated with coal mining activities. Oil and gas related disturbance represents over 70% of the remaining cumulative disturbance.

[2] Data for 2020 total cumulative disturbance and reclamation projections obtained from Appendix C, Table C-3 in the updated Task 2 Report (BLM 2009c).

[3] Data for 2020 cumulative coal-related disturbance and reclamation projections obtained from Appendix A, Table A-2 in the updated Task 2 Report (BLM 2009c). Math errors in that update have been corrected in table 4-10 and the above text for the Hay Creek II final EIS.



LEGEND

- Federal Coal Lease Areas
- Subwatersheds in the Environmental Consequence Study Area
- Coal Mine Groundwater Model (CMGM) Domain
- Railroads
- Former Surface Coal Mine Sites

COAL MINE SUBREGIONS

1	Subregion 1 -	Buckskin, Dry Fork, Eagle Butte, Rawhide, and Wyodak Mines
2	Subregion 2 -	Belle Ayr, Caballo, Coal Creek, and Cordero-Rojo Mines
3	Subregion 3 -	Jacobs Ranch, Black Thunder, North Antelope Rochelle, and Antelope Mines

No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 4-2

Wyoming Task 3 Study Area for PRB Coal Review Studies Evaluating Projected Environmental Consequences

Areas reclaimed during each future time period shown in table 4-10 reflect the amount of disturbed acreage projected to be permanently reclaimed by that respective point in time. For example, under the upper coal production scenario for 2020, of the 576,646 acres of total cumulative disturbance, approximately 397,155 (69%) would be reclaimed by 2020. The remaining 179,491 acres (31%) of disturbance would be reclaimed incrementally or following a project's completion, depending on the type of development activity and permit requirements.

Of the 149,089 acres of cumulative disturbance projected to be associated with coal mining through 2020, approximately 86,196 (58%) would be reclaimed by 2020. Of the remaining 62,893 acres of coal mining-related disturbance, it is estimated that approximately 28,345 acres (45%) would be unavailable for concurrent reclamation due to the presence of long-term facilities, which would be reclaimed near the end of each mine's life. Reclamation of the remaining 34,548 acres (55%) of projected disturbance through 2020 would proceed concurrently with mining operations.

The acres of unreclaimed disturbance would be reclaimed incrementally or following a project's completion, depending on the type of development activity and permit requirements. The acres currently not available for reclamation are occupied by long-term facilities that are needed to conduct mining operations or coal-related activities. These areas would be reclaimed near the end of each mine or facility's life.

The PRB Coal review study areas are defined by discipline for projected environmental consequences, with some changes to the watershed map (map 4-2) as defined below.

- The potential air quality impacts were evaluated over a multi-state area (including most of Wyoming, southeastern Montana, southwestern North Dakota, western South Dakota, and northwestern Nebraska) because they would be expected to extend beyond the Wyoming and Montana PRB air quality study area that was used to identify emissions sources for the air quality analysis.
- The socioeconomic impact analysis focused on Campbell County, but also considered Converse, Crook, Johnson, Sheridan, and Weston counties as directly affected and Niobrara and Natrona counties as indirectly affected.
- The groundwater drawdown was evaluated in the area surrounding and extending west of the surface coal mines shown on map 4-2 (groundwater study area), because that is the area where groundwater drawdown related to surface coal mining operations and CBNG production operations would overlap.

4.2.1 Topography and Physiography

The PRB is located within the Upper Missouri Basin Broken Lands physiographic subprovince that includes northeastern Wyoming and eastern Montana to the Canadian border. The topography generally is of low to moderate relief with occasional buttes and mesas. The general topographic gradient slopes down gently from southwest to northeast with elevations ranging from 5,000 to 6,000 feet above sea level on the southern and western portions of the PRB to less than 4,000 feet above sea level on the north and northeast along the Montana state line. The major drainages in the PRB are the Tongue, Powder, Belle Fourche, and Cheyenne rivers. Most of the drainages in the area are intermittent and have flows during high precipitation events or

during periods of snowmelt. The drainages are part of the upper Missouri River Valley drainage basin.

The disturbance associated with the majority of the past, present, and projected activities have resulted in or would result in the alteration of the surface topography. Surface coal mining, which is projected to continue in the area of the existing coal mines shown on map 4-2, permanently alters the topography by removing the overburden and coal and then replacing the overburden.

Recontouring during reclamation to match approximate original contours, as required by regulation, reduces the long-term impact on topography. After mined-out areas are reclaimed, the restored land surfaces are typically gentler, with more uniform slopes and restored basic drainage networks. Oil and gas exploration and development has occurred and is projected to continue throughout most of the Task 3 study area. It also results in the alteration of topography to accommodate facilities (e.g., well pads, power plants) and roads, but the disturbance tends to occur in smaller, more discrete areas than coal mining and the development is spread out over a larger area.

The disturbance and reclamation acreages associated with all existing and projected development in the Task 3 study area for the years 2003, 2007, 2010, 2015, and 2020 are given in table 4-10.

4.2.2 Geology, Mineral Resources, and Paleontology

The study area for geology, mineral resources, and paleontology is the Task 3 study area (map 4-2).

4.2.2.1 Geology

The PRB is one of a number of structural basins in Wyoming and the Rocky Mountain area that were formed during the Laramide Orogeny events. The basin is asymmetric with a structural axis that generally trends northwest to southeast along the western side of the basin (Flores et al. 1999). Natural earthquakes, landsides, and subsidence do not present a hazard in the PRB based on the lack of active faults in the study area (U.S. Geological Survey 2004); the low risk of ground shaking in the PRB if a maximum credible earthquake were to occur (Frankel et al. 1997); and the absence of evidence of subsidence, landslides, or other geologic hazards in association with CBNG production. USGS monitors the magnitude of blasting activity in the PRB under the Routine Mining Seismicity Earthquake Hazards Program (U.S. Geological Survey 2008). Seismic activity induced by coal mine blasting operations occurs throughout the PRB and has reached a USGS local magnitude rating of 3.6 in some instances (U.S. Geological Survey 2004).

4.2.2.2 Mineral Resources

Coal

Most of the coal resources in the PRB are found in the Fort Union and Wasatch formations; however, coal layers in the Wasatch formation are thinner and less continuous than those in the Fort Union formation. Therefore, Wasatch coal is not as economically important as Fort Union

coal for either coal mining or CBNG development. Projected levels of coal production and disturbance under the lower and upper coal production scenarios are listed in tables 4-2 and 4-3.

In the coal mine areas, the overburden and coal would be removed and the overburden replaced, resulting in a permanent change in the geology of the area and a permanent reduction of coal resources.

Oil and Gas

Drilling for conventional oil and gas in the Wyoming PRB has declined considerably in the last 15 years. However, as discussed above, increasing prices have led to increased interest in drilling, and there remains potential for finding and developing these resources in the deeper formations of the basin. Conversely, CBNG production increased rapidly from 1999 through 2002 but began to level off in 2003. Actual production rates for conventional oil and gas and CBNG in 2007 and projected rates for 2010, 2015, and 2020 are shown in tables 4-6 and 4-7.

Oil and gas and related development accounts for most of the projected mineral disturbance outside of the coal mining areas. It generally would result in only shallow, discrete areas of surface disturbance, as discussed above. The acreages over which these impacts were occurring (as of 2003 and 2007) and are projected to occur in the years 2010, 2015, and 2020 are included in the totals in table 4-10.

Other Mineral Resources

As discussed in section 4.1.3.1, other mineral resources that are being mined in the Wyoming PRB include uranium, bentonite, clinker, and aggregate. Production of uranium and bentonite is not likely to be affected by development of coal or CBNG in the PRB. Aggregate and clinker production levels are more likely to be affected by other mineral development levels because these resources would be used in construction projects related to other mineral development.

4.2.2.3 Paleontology

Paleontological Resources are any fossilized remains, traces, or imprints of organisms, preserved in or on the earth's crust, that are of paleontological interest and that provide information about the history of life on earth. Scientifically significant paleontological resources (including vertebrate, invertebrate, plant, and trace fossils) are known to occur in many of the geologic formations within the Wyoming PRB. These paleontological resources are documented in the scientific literature, in museum records, and are known by paleontologists and land managers familiar with the area. It has been determined that paleontological resources on federal land shall be managed and protected using scientific principles and expertise. Appropriate plans for the inventory, monitoring, and the scientific and educational use of these resources shall be developed, in accordance with applicable agency laws, regulations, and policies, These plans shall emphasize interagency coordination and collaborative efforts where possible with non-federal partners, the scientific community, and the general public.

Significant paleontological localities have been recorded on federal lands in some areas of the PRB. However, the absence of localities in the PRB does not always mean that scientifically significant fossils are not present, as much of the area within and surrounding the PRB has not been adequately explored for paleontological resources. As a result, development activities in

the Task 3 study area have the potential to adversely affect scientifically significant fossils, if they are present in or adjacent to disturbance areas.

The potential for impacts to scientifically significant paleontological resources are predicted to be greatest in areas where PFYC Class 4 or 5 (High or Very High) formations are present (see section 3.3.3.1). In addition, in most cases those rock units with a PFYC of 3 (Moderate or Unknown) will require some management decision and action. Class 3 formations are fossiliferous units where fossil content varies in significance, abundance, and predictable occurrence; or of unknown fossil potential. Surface-disturbing activities will require sufficient assessment to determine whether significant paleontological resources occur in the area of a proposed action, and whether that action could affect the paleontological resources.

The Wasatch Formation is the most geographically widespread unit exposed on the surface over most of the Task 3 study area. It is underlain by the Fort Union Formation. The fossiliferous (PFYC 5) Sundance, Morrison, Cloverly, and Lance formations crop out along the margins of the basin and occur at depth in the vicinity of the coal mines and CBNG activity in the eastern portion of the basin. Within the Task 3 study area, the highly fossiliferous (PFYC 5) White River Formation occurs only on Pumpkin Buttes in southwestern Campbell County.

In recent years, the Wasatch Formation has been downgraded to a Class 3a formation (geologic units with widely scattered scientifically significant fossils) in the PRB, but remains a Class 5 formation (highest rating) statewide. The Fort Union Formation is under consideration to be upgraded from a Class 3 (geologic units where fossil content varies in significance, abundance, and predictable occurrence; or of unknown fossil potential) to a Class 4 formation (geologic units containing a high occurrence of scientifically significant fossils) statewide. The Potential Fossil Yield Classifications of these rocks units, as well as many others in Wyoming, are currently under revision and may change in the near future.

The greatest potential impact on surface and subsurface paleontological resources would result from disturbance of surface sediments and shallow bedrock during construction and/or operations, depending on the type of project. Potential subsurface disturbance of paleontological resources (e.g., during drilling operations) would not be visible or verifiable. The areas over which these impacts occurred as of 2003 and 2007, and are projected to occur as a result of all projected development in the years 2010, 2015, and 2020, are shown in table 4-10. However, as only portions of the Task 3 study area have been evaluated for the occurrence of paleontological resources, and discrete locations for development activities cannot be determined at this time, no accurate estimate can be made as to the number of paleontological sites that may be affected by cumulative development activities. Development activities which involve federally owned surface and/or minerals are subject to federal guidelines and regulations protecting paleontological resources. Protection measures, permit conditions of approval, and/or mitigation measures would be determined on a project-specific basis at the time of permitting to minimize potential impacts on paleontological resources as a result of these activities.

4.2.3 Air Quality

There is substantial scientific evidence that increased atmospheric concentrations of GHG and land use changes are contributing to an increase in average global temperature. As of January 1, 2011, GHG are regulated pollutants. A discussion of this subject has been included in section 4.2.14.

The 2005 Task 1A Report (BLM 2005a) documents the modeled air quality impacts of operations during a baseline year, 2002, using actual emissions and operations for that year. Emissions from permitted minor sources were estimated, because actual emissions data was unavailable. The baseline year analysis evaluated impacts both within the PRB itself and at selected sensitive areas surrounding the region. The analysis specifically looked at impacts of coal mines, power plants, CBNG development, and other development activities. Results were provided for both Wyoming and Montana at the individual receptor areas. The 2005 Task 2 Report (BLM 2005b) identifies reasonably foreseeable development activities for the years 2010, 2015, and 2020.

The 2006 Task 3A Report (BLM 2006d) evaluates the impacts on air quality and air quality-related values for the year 2010 using the development levels projected for 2010—the same model and meteorological data that were used for the baseline year study in the Task 1A Report (BLM 2005a). The BLM updated the model and conducted an impact analysis for the year 2015. This updated model is reflected in the 2008 update to the Task 3A Report (BLM 2008a), which uses a revised baseline year of 2004 and revised projected scenarios for the year 2015. The BLM updated the model again in 2009 and conducted an impact analysis for the year 2020. The most recent update to the Task 3A Report for 2020 (BLM 2009d) uses the same baseline year of 2004 with revised projected scenarios for the year 2020. A revised baseline year emissions inventory was developed using 2004 actual emissions data or emissions estimates and has incorporated the recent analyses of emissions in Wyoming and Montana, which were not available when the 2010 modeling study was done.

Existing and projected emissions sources for the revised baseline year (2004) and 2015 and 2020 analyses were identified within a study area comprised of the following counties in the PRB in Wyoming and Montana:

- Campbell County, all of Sheridan and Johnson counties except the Bighorn National Forest lands west of the PRB, and the northern portion of Converse County, Wyoming; and
- Rosebud, Custer, Powder River, Big Horn, and Treasure counties, Montana.

A state-of-the-art, guideline dispersion model was used to evaluate impacts of the existing and projected source emissions on several source groups, as follows:

- near-field receptors in Wyoming and Montana covering the Task 1A and 3A study areas in each state (overall, the near-field receptor grid points were spaced at 1-kilometer intervals over the study area);
- receptors in nearby federally designated pristine or Class I areas; and
- receptors at other sensitive areas (Class II sensitive areas).

The EPA guideline CALPUFF model system version 5.8 (Scire et al. 1999a) was used for this study, which differs from the version used in the Task 1A and original Task 3A studies. The impacts for the baseline year (2004) and for 2015 and 2020 lower and upper coal production scenarios were directly modeled. As discussed above, the modeling domain extends over most of Wyoming, southeastern Montana, southwestern North Dakota, western South Dakota, and western Nebraska. An interagency group participated in developing the modeling protocol and related domain that were used for this analysis.

The modeling approach for the updated Task 3A Report used actual emissions from existing sources representative of 2004 operations and projected those emissions for the expected level of development in 2015 and in 2020 (BLM 2009d). Year 2004 emission inventory data were previously developed for the Montana Statewide Oil and Gas Supplemental EIS. No specific emissions data were available for the projected levels of development. The baseline year emissions data were gathered from a variety of sources but mainly relied on data collected by the WDEQ and the Montana Department of Environmental Quality. Only actual emission sources inside the study area described above were included in the modeling. Key major sources were included, such as the coal-fired power plants, gas-fired power plants, and sources that were included in the Title V (operating permit) program. The Dave Johnston power plant, which is located outside of but adjacent to the study area in Converse County, was included in the baseline year study and in the projected emissions. Some operational adjustments were made to accommodate small sources with air permits that were presumed to be operating at less than full capacity. Emissions from other sources, including estimated construction-related fugitive dust emissions, were computed based on EPA emission factors and on input data from the WDEQ.

The PRB Coal Review generally considers existing regional air quality conditions in the Task 1A and Task 3A study areas to be very good. There are limited air pollution emissions sources (few industrial facilities, including the surface coal mines, and few residential emissions in relatively small communities and isolated ranches) and good atmospheric dispersion conditions. The available data show that the region complies with the ambient air quality standards for NO_2 and SO_2. There have been no monitored exceedances of the annual PM_{10} standard in the Wyoming PRB.

Air quality modeling indicates the projected mine activities at the Buckskin Mine will comply with the PM_{10} and $PM_{2.5}$ near-field and short-term NO_2 air standards for the 2015 and 2020 modeled air quality impacts at the currently permitted mining rate. The applicant has indicated that they propose to mine either action alternative at a rate (average of 25 million tons per year) well below its currently permitted level (42 million tons per year). Visibility data collected around the region indicate that, although there are some days with notable impacts at Class I areas, the general trend in the region shows little change in visibility impacts at the Badlands National Park and Jim Bridger Wilderness Area from 1989 to 2005 (figure 3.4-2).

Predicted impacts from baseline year (2004) and projected 2015 and 2020 emissions were modeled for four air quality criteria pollutants (NO_2, SO_2, $PM_{2.5}$, and PM_{10}), along with changes in air quality-related values at Class I and identified sensitive areas. For regulatory purposes, the Class I PSD evaluations are not directly comparable to the air quality permitting requirements, because the modeling effort does not identify or separately evaluate increment-consuming sources that would need to be evaluated under the PSD program. The cumulative impact

analysis focuses on changes in cumulative impacts, but not on a comparison to PSD-related evaluations, which would apply to specific sources.

Table 4-11 presents the modeled impacts on ambient air quality at the near-field receptors in Montana and Wyoming. Results shown represent the maximum impact at any point in each receptor group; data are provided for the baseline year (2004) analysis and for both coal production scenarios for 2015 and 2020. Peak impacts occur at isolated receptors and are likely due to unique source-receptor relationships. The model results should not be construed as predicting an actual exceedance of any standard, but are at best indicators of potential impacts.

The results of the modeling depict the anticipated changes under both the lower and upper development scenarios (table 4-11). For the Wyoming near-field receptors, the predicted impact of the 24-hour PM_{10} and $PM_{2.5}$ concentrations show localized exceedances in the region of the NAAQS for the baseline year (2004), as well as for both development scenarios for 2015 and 2020. Both 2020 development scenarios show the concentration increases by a factor of 2.5 relative to the base year for these two parameters. Additionally, while down about 10% from 2015, the 2020 development shows a 20% increase of annual PM_{10} and $PM_{2.5}$ concentrations at peak Wyoming near-field receptors relative to the base year. This level of increase for 2020 predicted modeled exceedances of annual standards for $PM_{2.5}$ that year. Impacts of NO_2 and SO_2 emissions are predicted to be below the NAAQS and WAAQS at the Wyoming near-field receptors.

Based on the modeling results, impacts at Montana near-field receptors would be in compliance with the NAAQS and the Montana Ambient Air Quality Standard (MAAQS) for all pollutants and averaging periods, with one exception (table 4-11). Importantly, the 1-hour NO_2 concentrations at Montana near-field receptors for all years and development scenarios were predicted to exceed the NAAQS. Those concentrations were also predicted to exceed the MAAQS in 2015 at isolated locations because of CBNG development in Wyoming; however, with the anticipated southward progression of the CBNG wells, the 1-hour NO_2 concentrations in 2020 are predicted to remain below the MAAQS. The southward progression of the CBNG wells also contributes to a predicted slight decrease in 2020 of impacts for annual NO_2, PM_{10} and $PM_{2.5}$ relative to the baseline year. Although large percentage increases were predicted in SO_2 impacts by 2020, especially for 1- and 3-hour monitoring, those levels would remain below the national and state ambient standards for all pollutants in the Montana near-field.

As discussed in section 3.4.2.2, modeling tends to over-predict the 24-hour impacts of surface coal mining and, as a result, the WDEQ does not consider short-term PM_{10} modeling to be an accurate representation of short-term impacts. In view of this, a memorandum of agreement between the WDEQ and EPA Region VIII, dated January 24, 1994, allows the WDEQ to conduct monitoring in lieu of short-term modeling for assessing coal-mining-related impacts in the PRB. This agreement also requires "best available work practice" mitigation measures in all coal mining permits (WDEQ and EPA 1994). The monitored exceedances at surface coal mines in the Wyoming PRB and the measures that the WDEQ has implemented or is proposing to implement to prevent future exceedances of the PM_{10} NAAQS are discussed in chapter 3, sections 3.4.2.1 and 3.4.2.3.

Table 4-11. Projected Maximum Potential Near-Field Impacts (µg/m³)

Pollutant	Averaging Time	Base Year (2004) Impacts	2015 Lower Coal Development Scenario Impacts	2015 Upper Coal Development Scenario Impacts	2020 Lower Coal Development Scenario Impacts	2020 Upper Coal Development Scenario Impacts	National AAQS	Wyoming AAQS	Montana AAQS	PSD Class II Increments
Wyoming Near-Field										
NO_2	Annual	31.3	46.7 47.4	30.5	30.6		100	100	—[a] 25	
SO_2	Annual	15.3	16.2 16.2	16.4	16.5		80	60	—	20
	24-hour	112.3	119.6 119.	6 143.	3 143.	3	365	260	—	91
	3-hour	462.0	814.1 814.	1 936.	7 936.	7	1,300	1,300	—	512
$PM_{2.5}$ Annu	al	13.4	**18.7**	**21.4**	**16.3**	**16.3**	15 15		—	—
24-h	our	**87.6**	**179.5**	**179.5**	**218.4**	**218.4**	35 35		—	—
PM_{10} Annu	al	38.4	**53.5**	**61.0**	46.6 46.6		—	50[b] —		17
24-h	our	**250.4**	**512.8**	**512.9**	**624.1**	**624.3**	150 150		—	30
Montana Near-Field										
NO_2	Annual	3.3	6.5 6.5	2.5	2.6		100	—	100	25
1-ho	ur	**409.0**	**826.3**	**826.4**	**440.1**	**442.7**	188.1 —		564	—
SO_2	Annual	1.6	1.7 1.7	3.0	3.1		80	—	80	20
	24-hour	16.1	16.5 16.6	24.7	27.1		365	—	365	91
3-ho	ur	65.0	66.5	66.5	138.9	138.9	1,300	—	1,300	512
	1-hour	162.9	166.6 166.	6 237.	0 259.	1	—	—	1,300	—
$PM_{2.5}$	Annual	1.0	1.8 1.9	0.9	0.9		15	—	15	—
	24-hour	10.2	15.4 20.6	10.2	10.2		35	—	35	—
PM_{10}	Annual	2.8	5.2 5.3	2.5	2.6		—	—	50	17
	24-hour	29.1	44.0 58.5	29.3	29.3		150	—	150	30

µg/m³ = microgram per cubic meter; AAQS = Ambient Air Quality Standards; PSD = prevention of significant deterioration; NO = nitrogen oxide; SO_2 = sulfur dioxide; PM_{10} = particulate matter measuring 10 microns or less in diameter; $PM_{2.5}$ = particulate matter measuring 2.5 microns or less in diameter

[a] No standard or increment.

[b] The EPA has revoked the NAAQS annual PM_{10} standard of 50 µg/m³, but that standard is still effective for Wyoming until it enters into rulemaking to revise the state AAQS.

Bold values indicate projected exceedance of national and/or state ambient air quality standards.

Source: 2009 update to the Task 3A Report (BLM 2009d).

The maximum modeled impact on the annual $PM_{2.5}$ level is projected to be above the standard (15 $\mu g/m^3$) at near-field receptors in Wyoming for the lower and upper coal production scenarios for both 2015 and 2020. Annual PM_{10} levels are projected to be above the standard (50 $\mu g/m^3$) at near-field receptors in Wyoming for 2015, and then to fall back below the standard for the 2020 lower and upper coal production scenarios. The EPA has revoked the NAAQS annual PM_{10} standard of 50 $\mu g/m^3$, but until Wyoming enters into rulemaking to revise the WAAQS, that standard is still effective. The WDEQ issues air quality permits for coal mining. That agency cannot issue any permit that violates ambient air quality standards. As noted, impacts of NO_2 and SO_2 emissions are predicted to be below the NAAQS and WAAQS at all Wyoming near-field receptors for all years. A large portion of the impacts for all scenarios would be associated with coal-related sources, although non-coal sources would contribute a notable portion of the impact.

Table 4-12 lists the three Class I areas and two Class II areas where the modeled impacts are the greatest. The table compares the modeled impacts to the PSD Class I and sensitive Class II increment levels. However, it must be noted that this modeling analysis did not separate PSD increment-consuming sources from those that do not consume increment. The PSD-increment comparison is provided for informational purposes only and cannot be directly related to a regulatory interpretation of PSD increment consumption.

Most modeled impacts for the four pollutants (NO_2, SO_2, $PM_{2.5}$, and PM_{10}) analyzed are below the Class I increment levels in all coal development scenarios (base year, lower and upper 2015 and 2020). At the Northern Cheyenne Indian Reservation and Wind Cave National Park, impacts are slightly above the Class I comparative increment levels for 24-hour PM_{10} in all years (baseline, 2015, 2020) and development scenarios (table 4-12). Those impacts are also above the Class I increments at the Badlands National Park for both scenarios in 2020. Additionally, the SO_2 impacts at the Northern Cheyenne Indian Reservation for the 3-hour and 24-hour averaging period exceed the Class I PSD increment levels for one or both development scenarios in 2020. In the other Class I areas, only the modeled 24-hour SO_2 impacts at Theodore Roosevelt National Park and Fort Peck Indian Reservation, and 3-hour SO_2 impacts at Theodore Roosevelt National Park are above the PSD increment levels for the 2020 development scenarios. However, the predicted exceedances for these areas are related to sources outside the PRB study area, consequently, neither area is included in table 4-12.

In the sensitive Class II areas, the only modeled exceedances of the Class II PSD increments relate to the 24-hour PM_{10} levels at the upper 2015 development scenario in the Cloud Peak Wilderness Area and Crow Indian Reservation. The modeled annual NO_2 impacts at those two areas are projected to increase by a factor of 2 to 4, respectively, in 2020 as a result of projected CBNG and coal hauling activities. However, modeling results for all sensitive Class II areas are far below PSD increment levels for all pollutants for both 2020 development scenarios.

Table 4-12. Maximum Predicted PSD Class I and Sensitive Class II Area Impacts (µg/m³)

Location	Pollutant	Averaging Period	Base Year (2004) Impacts	2015 Lower Coal Development Scenario	2015 Upper Coal Development Scenario	2020 Lower Coal Development Scenario	2020 Upper Coal Development Scenario	PSD Class I/II Increments
Class I Areas[a]								
Northern Cheyenne Indian Reservation	NO_2	Annual	0.4	0.6 0.9	0.8		1.1 2.5	
	SO_2	Annual	0.5	0.6 0.7	1.1		1.3 2	
		24-hour 3.1		3.4	3.4	**7.1**	**12.8**	5
		3-hour 9.4		9.6	9.6	23.6	**39.7**	25
	$PM_{2.5}$	Annual	0.3	0.5 0.5	0.4		0.5	—[b]
		24-hour	3.4	5.1 5.1	4.5		4.6	—
	PM_{10}	Annual	0.9	1.5 1.5	1.2		1.5 4	
		24-hour	**9.6**	**14.4**	**14.6**	**12.9**	**13.2**	8
Badlands National Park	NO_2	Annual	0.1	0.0 0.0	0.2		0.2 2.5	
	SO_2	Annual	0.5	0.2 0.2	0.6		0.2 2	
		24-hour	3.6	3.1 3.1	4.0		4.0 5	
		3-hour	8.1	6.3 6.3	8.2		8.2	25
	$PM_{2.5}$	Annual	0.2	0.1 0.1	0.3		0.3	—
		24-hour	2.1	1.6 1.6	3.0		3.1	—
	PM_{10}	Annual	0.7	0.2 0.2	0.9		1.0 4	
		24-hour 5.9		4.6	4.7	**8.5**	**8.8**	8
Wind Cave National Park	NO_2	Annual	0.2	0.3 0.3	0.3		0.3 2.5	
	SO_2	Annual	0.7	0.8 0.8	0.8		0.8 2	
		24-hour	3.7	4.1 4.1	4.6		4.7 5	
		3-hour	7.0	7.4 7.4	7.5		7.7	25
	$PM_{2.5}$	Annual	0.4	0.5 0.5	0.5		0.5	—
		24-hour	3.8	4.6 4.7	4.6		4.7	—
	PM_{10}	Annual	1.0	1.3 1.4	1.4		1.4 4	
		24-hour	**10.9**	**13.3**	**13.6**	**13.0**	**13.3**	8

Table 4-12. Continued

Location	Pollutant	Averaging Period	Base Year (2004) Impacts	2015 Lower Coal Development Scenario	2015 Upper Coal Development Scenario	2020 Lower Coal Development Scenario	2020 Upper Coal Development Scenario	PSD Class I/II Increments
Sensitive Class II Areas[c]								
Cloud Peak Wilderness Area	NO_2	Annual	0.06	0.6 0.7	0.12		0.12	25
	SO_2	Annual	0.2	0.6 0.6	0.3		0.3	20
		24-hour	2.0	3.7 4.0	2.5		2.5	91
		3-hour	8.0	14.3	14.3	8.9	9.0	512
	$PM_{2.5}$	Annual	0.2	0.5 0.7	0.2		0.2	—
		24-hour	2.6	7.8	11.9	3.2	3.39	—
	PM_{10}	Annual	0.5	1.6 2.1	0.7		0.7	17
		24-hour	7.4	22.3	**34.1**	9.1 9.3		30
Crow Indian Reservation	NO_2	Annual	0.9	1.4 1.7	3.6		4.2	25
	SO_2	Annual	2.3	2.3 2.3	2.4		2.7	20
		24-hour	14.4	14.6 14.6	14.8		14.8	91
		3-hour	76.8	77.0 77.0	77.0		77.0	512
	$PM_{2.5}$	Annual	0.8	1.0 1.4	0.8		0.8	—
		24-hour	7.2	9.4	14.3	7.2	7.2	—
	PM_{10}	Annual	2.2	2.9 4.1	2.3		2.4	17
		24-hour	20.5	26.9	**40.7**	20.6 20.6	30	

PSD = prevention of significant deterioration; $\mu g/m^3$ = microgram per cubic meter; NO_2 = nitrogen dioxide; SO_2 = sulfur dioxide; PM_{10} = particulate matter measuring 10 microns or less in diameter; $PM_{2.5}$ = particulate matter measuring 2.5 microns or less in diameter

[a] Pristine attainment area.

[b] No standard or increment.

[c] Certain federal assets with Class II status for which air quality and/or visibility are valued resources.

Bold values indicate exceedance of PSD class I or II increment.

Source: 2009 update to the Task 3A Report (BLM 2009d).

Table 4-13 provides a detailed listing of visibility impacts for all analyzed Class I and sensitive Class II areas. For the baseline year, the maximum visibility impacts at Class I areas were determined to be at the Northern Cheyenne Indian Reservation in Montana and at Wind Cave and Badlands National Park in South Dakota. For these locations, the base year showed more than 200 days of impacts with more than 10% light extinction (i.e., reduction in visibility). A 10% change in light extinction corresponds to 1.0 dv, which is an expression of visibility impairment. A change in visibility of 1.0 dv represents a "just noticeable change" by an average person under most circumstances. Increasing dv values represent proportionately larger perceived visibility impairment.

To provide a basis for discussing the modeled visibility impacts resulting from the projected increased production under the lower and upper coal production scenarios for 2015 and 2020, the visibility impacts for the base year of 2004 were subtracted from the modeled results for those two years. Table 4-13 shows the number of additional days that the projected impacts were greater than 1.0 dv (10% change in light extinction) for each site under the upper and lower coal production scenarios for each modeled year. Using Badlands National Park as an example, the analysis showed 218 days with impacts greater than 1.0 dv in 2004. Under the 2015 and 2020 coal production scenarios, the modeling analysis projects an additional 26 and 44 days, respectively, with impacts greater than 1.0 dv under both the lower and upper development scenarios. That equates to a total of 244 to 262 days with impacts greater than 1.0 dv, respectively.

Both the 2015 and 2020 modeled visibility impacts at the identified Class I areas (table 4-13) continue to show a similar pattern as exhibited for the baseline year (2004), with the highest number of days with a greater than 10% change in visibility predicted at the three most affected Class I areas. All but four of the sensitive Class II areas had more than 100 days with greater than a 10% change during the base year. The most significant visibility changes to sensitive Class II areas in both 2015 and 2020 are predicted for Mount Rushmore National Monument, followed by Black Elk Wilderness Area (table 4-13). Class II areas do not have any visibility protection under federal or state law.

For acid deposition, all predicted impacts are below the deposition threshold values for both nitrogen and sulfur compounds. There are substantial percentage increases in deposition under the lower and upper coal production scenarios for 2015; however, impacts remain well below the nitrogen and sulfur levels of concern (1.5 and 5.0 kilograms per hectare per year, respectively). The acid-neutralizing capacity of sensitive lakes also was analyzed, and results are summarized in table 4-14. The base year study indicated that none of the lakes had predicted significant impacts except Upper Frozen Lake; however, the lower and upper development scenarios for both 2015 and 2020 show an increased impact at Florence Lake, leading to an impact above the 10% change in acid-neutralizing capacity. Impacts also are predicted to be above 1 microequivalent per liter for Upper Frozen Lake.

Table 4-13. Modeled Change in Visibility Impacts at Class I and Sensitive Class II Areas

Location	Base Year (2004)	Coal Development Scenario			
		2015 Lower	2015 Upper	2020 Lower	2020 Upper
	No. of Days >10% Change in Visibility	Change in No. of Days >10% in visibility			
Class I Areas[a]					
Badlands National Park	218	26 26	44	44	
Bob Marshall Wilderness Area	8	0 0 0 0			
Bridger Wilderness Area	144	2 2 5 5			
Fitzpatrick Wilderness Area	91	2 2 6 6			
Fort Peck Indian Reservation	105	10	10	20	21
Gates of the Mountain Wilderness Area	55	0	0	4	4
Grand Teton National Park	70	2	2	6	6
North Absaroka Wilderness Area	61	3	3	8	8
North Cheyenne Indian Reservation	243	32	47	59	60
Red Rock Lakes	42	2 2 3 3			
Scapegoat Wilderness Area	27	1 1 2 2			
Teton Wilderness Area	57	4 4 8 8			
Theodore Roosevelt National Park	178	5	9	24	24
UL Bend Wilderness Area	77	8	10	18	18
Washakie Wilderness Area	83	5 5 8 8			
Wind Cave National Park	262	18	19	28	31
Yellowstone National Park	84	2 2 5 5			

Table 4-13. Continued

Location	Base Year (2004)	Coal Development Scenario			
		2015 Lower	2015 Upper	2020 Lower	2020 Upper
	No. of Days >10% Change in Visibility	Change in No. of Days >10% in visibility			
Sensitive Class II Areas[b]					
Absaroka Beartooth Wilderness Area	101	2	3	10	10
Agate Fossil Beds National Monument	251	20	20	26	26
Big Horn Canyon National Rec. Area	331	1	3	1	1
Black Elk Wilderness Area	236	34	36	47	47
Cloud Peak Wilderness Area	126	18	18	29	30
Crow Indian Reservation	360	4 4 3 3			
Devils Tower National Monument	274	25	25	31	32
Fort Belknap Indian Reservation	66	6	7	14	15
Fort Laramie National Historic Site	260	10	10	15	16
Jedediah Smith Wilderness Area	79	1 1 3 5			
Jewel Cave National Monument	261	19 21	36	37	
Lee Metcalf Wilderness Area	97	2 2 2 2			
Mount Naomi Wilderness Area	51	1	1	1	1
Mount Rushmore National Monument	222	36 36	49	52	
Popo Agie Wilderness Area	139	4	4	6	6
Soldier Creek Wilderness Area	268	18	18	19	19
Wellsville Mountain Wilderness Area	130	10	10	17	17
Wind River Indian Reservation	217	2	5	9	10

[a] Pristine attainment area.
[b] Certain federal assets with Class II status for which air quality and/or visibility are valued resources.
Source: 2009 update to the Task 3A Report (BLM 2009d).

Table 4-14. Predicted Total Cumulative Change in Acid-Neutralizing Capacity of Sensitive Lakes

Location	Lake	Background ANC (µeq/L)	Area (hectares)	Base Year 2004 Change (percent)	2015 Lower Coal Development Scenario Change (percent)	2015 Upper Coal Development Scenario Change (percent)	2020 Lower Coal Development Scenario Change (percent)	2020 Upper Coal Development Scenario Change (percent)	Thresholds (percent)
Bridger Wilderness Area	Black Joe	67.0	890	4.00	4.11	4.11	4.26	4.27	10
	Deep 60.0		205	4.70	4.82	4.82	4.98	4.99	10
	Hobbs 70.0		293	3.95	4.03	4.03	4.14	4.15	10
	Upper Frozen	5.0	64.8	**2.42**	**2.47**	**2.48**	**2.55**	**2.56**	1[a]
Cloud Peak Wilderness Area	Emerald 55.3		293	5.24	5.97	6.02	6.69	6.30	10
	Florence 32.7		417	9.09	**10.41**	**10.48**	**11.79**	**11.99**	10
Fitzpatrick Wilderness Area	Ross 53.5		4,455	2.72	2.79	2.79	2.89	2.90	10
Popo Agie Wilderness Area	Lower Saddlebag	55.5 155		6.28	6.42	6.43	6.65	6.67	10

µeq/L = microequivalents per liter

[a] Data for Upper Frozen Lake presented in changes in µeq/L rather than percent change (for lakes with less than 25 µeq/L background acid-neutralizing capacity).

Bold values indicate exceedance of threshold percent.

Source: 2009 update to the Task 3A Report (BLM 2009d).

The study also modeled impacts of selected hazardous air pollutant emissions (benzene, ethyl benzene, formaldehyde, n-hexane, toluene, and xylene) on receptors with the highest ambient impacts. The near-field receptors in Wyoming and Montana were analyzed for annual (chronic) and 1-hour (acute) impacts. Model results for the baseline year (2004) and the 2015 and 2020 development scenarios show that impacts are predicted to be well below the acute reference exposure levels, non-carcinogenic reference concentrations for chronic inhalation, and carcinogenic risk threshold for all hazardous air pollutants. The maximally exposed individual's carcinogenic risk factor because of benzene exposure is predicted to increase 50% as a result of projected development in the PRB; however, even with this substantial increase, the predicted risk is well below EPA carcinogenic risk thresholds.

Comparing the updated Task 3A Report for 2020 (BLM 2009d) to the earlier update for 2015 (BLM 2008d) shows a similar general increase in air quality effects over time compared to the base year. The production from conventional oil and gas and CBNG activities is projected to peak at 2010, with slight declines predicted over the following decade. The production from CBNG activities was projected to peak at 2015, with slight declines predicted over the following decade; however the actual development has been slower than predicted and therefore the peak year has been shifted later. Therefore, from these sources, expected impacts have increased slightly from 2015 to 2020. The coal mining and CBNG sources would be the major contributors to PM_{10} and $PM_{2.5}$ impacts in the near-field between 2015 and 2020, and these impacts would result from the proximity of the receptors to both the operations. As noted above, the general south and westward trend of CBNG activity has lowered NO_2 and particulate air quality effects projected in Montana by 2020.

Power plants currently are the major contributors to all SO_2 impacts in the near-field in both states; however, the projected impacts are well below any ambient standard or PSD increment. According to the PRB Coal Review Air Quality modeling analysis, predicted future expansion modeled to the year 2020 should not jeopardize the attainment of those standards. Impacts on NO_2 concentrations are the result of emissions from all the source groups. No one source group dominates the NO_2 impacts in the near-field.

A pattern that is similar to the near-field receptors holds true for the Class I and sensitive Class II receptor groups. Essentially, the coal mine operations and CBNG operations would continue to dominate the PM_{10} and $PM_{2.5}$ impacts, the power plants would continue to dominate the SO_2 impacts (although they would continue to be below the standards), and the overall source groups would continue to contribute to NO_2 impacts. Impacts should remain below the annual NO_2 standard for 2015 and 2020 in Wyoming and Montana.

Based on modeling results, one of the lakes (Florence) in the Cloud Peak Class I area and one lake (Upper Frozen Lake) in the Bridger Class I area exceeded the acid deposition thresholds for both the lower and upper coal production scenarios for 2015. With the exception of Florence and Upper Frozen lakes, the projected increases in coal development (and power plants) are not expected to raise the deposition levels above the thresholds extended into 2020. The model results showed that the increased deposition, largely from SO_2 emissions from power plants, exceeded the thresholds of significance for the acid-neutralizing capacity at sensitive (high alpine) lakes. The results indicate that with increased growth in power plant operations, the reduced acid-neutralizing capacity of the sensitive lakes would need to be addressed carefully for each proposed major development project.

The WDEQ mitigation and monitoring requirements for coal mine emissions are discussed in sections 3.4.2.3 and 3.4.3.3. The discussion in these sections includes the operational control measures that are currently in place and would be required for mining operations on LBAs that are issued in the future, as well as measures that may be required to avoid future exceedances of the WAAQS and NAAQS and/or future mine-related impacts on the public.

4.2.4 Water Resources

Surface and groundwater are used extensively throughout the PRB for agricultural, water supply, municipal water supply, and both domestic and industrial water supply. Surface water use is limited to major perennial drainages, and agricultural areas within the basin are found mainly along these drainages. Reservoirs are also used throughout the basin for agricultural water supply. Municipal water supply comes from a combination of surface and groundwater. Domestic and industrial water supply primarily is from groundwater.

The updated Task 1B Report (BLM 2009e) describes the baseline year (2002) water resource conditions in that study area, which comprises all of Campbell County, all of Sheridan and Johnson counties less the Big Horn National Forest lands to the west of the PRB, and the northern portion of Converse County (map 4-1). The updated Task 3B Report (BLM 2009f) presents potential future cumulative groundwater impacts in the area of CBNG development and coal mine expansion in the eastern PRB (map 4-2), and provides a cumulative impact assessment of surface water quality and channel stability from surface discharge of groundwater from CBNG development.

4.2.4.1 Groundwater

Five main aquifers are present in the PRB Coal Review ground water study area (map 4-1) that can be used for water supply:

- Madison Aquifer System;
- Dakota Aquifer System;
- Fox Hills/Lance Aquifer System;
- Fort Union/Wasatch Aquifer System; and
- Quaternary Alluvial Aquifer System.

The Fort Union/Wasatch Aquifer System includes the coal and overburden aquifers that are directly affected by surface coal mining and CBNG development. It is also a major source of local water supply for domestic and stock water use. Table 4-15 shows the recoverable groundwater in the components of the Fort Union/Wasatch Aquifer System. The Wasatch Formation is more of a local aquifer, while the Fort Union Formation is a regional aquifer. The volumes of recoverable groundwater from the sandstones within the Wasatch/Tongue River Aquifer, the Lebo confining layer, and the Tullock Aquifer were determined from the volume of sandstone in each of these units multiplied by the 13% specific yield value for sandstone. Similarly, the volume of recoverable groundwater from the coals within the Wasatch/Tongue River was calculated from the volume of coal multiplied by the 0.4% specific yield value for coal.

Table 4-15. Recoverable Groundwater in the Fort Union/Wasatch Aquifer System in the PRB

Hydrogeologic Unit	Surface Area (acres)	Average Formation Thickness (feet)	Percentage of Sand/Coal	Average Sand/Coal Thickness (feet)	Specific Yield (percent)	Recoverable Groundwater (acre-feet)[a]
Wasatch-Tongue River Aquifer Sandstones	5,615,609	2,03 5	50.0	1,018	13.0	743,121,790
Wasatch-Tongue River Aquifer Coals	4,988,873	2,03 5	6.2	126	0.4	2,516,519
Lebo Confining Layer Sandstones	6,992,929	1,00 9	33.0	250	13.0	227,137,339
Tullock Aquifer Sandstones	7,999,682	1,110	52.0	430	13.0	447,246,784

[a] Calculated by multiplying Surface Area × Average Sand/Coal Thickness × Specific Yield. These numbers vary slightly from the numbers presented in table 3-5 of the Final Environmental Impact Statement and Proposed Plan Amendment for the PRB Oil and Gas Project.

Source: BLM 2003.

In response to statutory requirements and concerns, several studies and a number of modeling analyses have been conducted to help predict the impacts of surface coal mining on groundwater resources in the Wyoming portion of the PRB. Some of these studies and modeling analyses are discussed below.

In 1987, the USGS, in cooperation with the WDEQ and OSM conducted a study of the hydrology of the eastern PRB. The resulting description of the cumulative hydrologic effects of all current and anticipated surface coal mining (as of 1987) was published in 1988 in the USGS Water-Resources Investigation Report, *Cumulative Potential Hydrologic Impacts of Surface Coal Mining in the Eastern Powder River Structural Basin, Northeastern Wyoming*, referred to herein as the USGS CHIA (Martin et al. 1988). This report evaluates the potential cumulative groundwater impacts of surface coal mining in the area and is incorporated by reference into this EIS. The USGS CHIA analysis considered 16 current mines and 6 proposed mines in the PRB as of 1987. It did not evaluate potential groundwater impacts related to additional coal leasing in this area, and it did not consider the potential for overlapping groundwater impacts from coal mining and CBNG development.

Each mine must assess the probable hydrologic consequences of mining as part of the mine permitting process. The WDEQ must evaluate the cumulative hydrologic impacts associated with each proposed mining operation before approving the mining and reclamation plan for each mine, and they must find that the cumulative hydrologic impacts of all anticipated mining would not cause material damage to the hydrologic balance outside of the permit area for each mine. In response to these requirements, each existing approved mining permit includes an analysis of the hydrologic impacts of the surface coal mining proposed at that mine. If major amendments to mining and reclamation permits are proposed, then the potential cumulative impacts of the revisions must also be evaluated. If the proposed tract or an alternative tract configuration is leased to the respective applicant, the existing mining and reclamation permit for the mine must be revised and approved to include the new lease before it can be mined.

The PRB Oil and Gas Project Final EIS (BLM 2003) includes a modeling analysis of the groundwater impacts if an additional 39,000 new CBNG wells are drilled in the PRB by the end

of 2011. The project area for this EIS, which covers all of Campbell, Sheridan, and Johnson counties, as well as the northern portion of Converse County, is similar to the study area for the Task 1 and Task 2 study areas (map 4-1).

The coal mine groundwater monitoring data are published each year by the Gillette Area Groundwater Monitoring Organization (GAGMO), a voluntary group formed in 1980. Members of GAGMO include most of the companies with operating or proposed mines in the Wyoming PRB, WDEQ, Wyoming SEO, BLM, USGS, and OSM. GAGMO contracts with an independent firm each year to publish the annual monitoring results. GAGMO also periodically publishes reports summarizing the water monitoring data collected since 1980 in the Wyoming PRB (e.g., Hydro-Engineering 1991, 1996, 2001a, and 2007).

Another source of data on the impacts of surface coal mining on groundwater is the monitoring that is required by the WDEQ and administered by the mining operators. Each mine is required to monitor groundwater levels and water quality in the affected coal aquifers, in the shallower aquifers (overburden and alluvium), and in the subcoal aquifers in the area surrounding their operations. Monitoring wells are also required to record water levels and water quality in reclaimed areas. Hydrologic monitoring data and analyses are submitted to the WDEQ annually.

The cumulative impacts on groundwater resources associated with large-scale surface coal mining in the eastern PRB have been identified as five major issues:

1. The extent of the temporary lowering of static water levels in the aquifers around the mines due to dewatering associated with removal of aquifers within the mine boundaries.
2. Potential overlapping drawdown due to proximity of coal mining and CBNG development.
3. The effect of the removal of the coal aquifer and any overburden aquifers within the mine area and replacement of these aquifers with backfill material.
4. Changes in groundwater quality as a result of mining.
5. The effects of the use of water from the subcoal Fort Union Formation by the mines.

The first major issue is the extent of water level drawdown in the coal and shallower aquifers in the area surrounding the mines. In general, the saturated sand aquifers in the Wasatch Formation overburden have limited extent and, as a result, the drawdowns in the Wasatch Formation are much smaller and cover much less area than the coal drawdowns.

The GAGMO 25-year report provides actual groundwater drawdown information after 25 years of mining (Hydro-Engineering 2007). Of the 530 monitoring wells included in the GAGMO 25-year report, 195 are completed in the Upper Fort Union (or Wyodak) coal beds and 193 are completed in the overlying sediments or interburden between the coal beds located within and near the mine sites in the eastern PRB. The balance of the monitoring wells are completed in local alluvial aquifers or in strata below the lowest coal seam mined. Since 1996, some BLM monitor wells have been included in the GAGMO reports.

The USGS CHIA predicted the approximate area of 5 feet or more water level decline in the Wyodak coal aquifer which would result from "all anticipated coal mining." "All anticipated coal mining" included 16 surface coal mines operating at the time the report was prepared and six additional mines proposed at that time. All of the currently producing mines, including the three applicant mines in the Wright area, were considered in the USGS CHIA analysis (Martin et al. 1988). The study predicted that water supply wells completed in the coal may be affected as far away as 8 miles from mine pits, although the effects at that distance were predicted to be minimal.

As drawdown propagates to the west, available drawdown in the coal aquifer increases. Available drawdown is defined as the elevation difference between the potentiometric surface (elevation to which water will rise in a well bore) and the bottom of the aquifer. Proceeding west, the coal depth increases faster than the potentiometric surface declines, so available drawdown in the coal increases. Since the depth to coal increases, most stock and domestic wells are completed in units above the coal. Consequently, with the exception of CBNG wells, few wells are completed in the coal in the areas west of the mines. Those wells completed in the coal have considerable available drawdown, so it is unlikely that surface coal mining would cause adverse impacts on wells outside the immediate mine area.

Wells in the Wasatch Formation were predicted to be affected by drawdown only if they were within 2,000 feet of a mine pit (Martin et al. 1988). Drawdown occurs farther from the mine pits in the coal than in the shallower aquifers because the coal is a confined aquifer that is areally extensive. The area in which the shallower aquifers (Wasatch Formation, alluvium, and clinker) experience a 5-foot drawdown would be much smaller than the area of drawdown in the coal because the shallower aquifers are generally discontinuous, of limited areal extent, and often unconfined.

When the USGS CHIA was prepared in 1988 there were about 1,200 water supply wells within the maximum impact area defined in that study. Of those wells, about 580 were completed in Wasatch aquifers, about 100 in the Upper Fort Union (or Wyodak coal) aquifer, and about 280 in strata below the coal. There were no completion data available for the remainder of the wells (about 240) at that time.

If the proposed tract or alternative tract configuration is leased and mined, the groundwater drawdown would be extended into the area surrounding the proposed new leases. When a lease is issued to an existing mine for a maintenance tract, the mine must revise its existing mining permit to include the new tract in its mine and reclamation plans. In order to do that, the lessee would be required to conduct a detailed groundwater analysis to predict the extent of drawdown in the coal and overburden aquifers caused by mining the new lease. The WDEQ would use the revised drawdown predictions to update their cumulative hydrologic impact analysis (WDEQ-CHIA) for this portion of the PRB. The applicants have installed monitoring wells that would be used to confirm or refute drawdown predicted by analysis. These analyses would be required as part of the WDEQ mine permitting procedure, which is discussed in chapter 1 of this EIS.

The updated Task 2 Report (BLM 2009c) defines the past and present development actions in the PRB study area, which comprises all of Campbell County, all of Sheridan and Johnson counties less the Bighorn National Forest lands, and the northern portion of Converse County (map 4-2). The Task 2 Report also defines the projected reasonably foreseeable development scenarios in

the PRB for years 2010, 2015, and 2020, and provides the basis for the analysis of potential cumulative impacts in the Task 3 component of the study.

The updated Task 3B Report (BLM 2009f) summarizes the modeled changes in groundwater levels projected for 2010, 2015, and 2020 in the eastern PRB within approximately 25 miles of the coal mines. The study area for water resources encompasses the groundwater model domain (map 4-2), with emphasis placed on the overlap in the groundwater drawdown areas related to coal mining and CBNG. Projected groundwater level changes primarily are because of CBNG groundwater withdrawal in the Upper Fort Union Formation and to both CBNG pumping and discharge along with coal mine pit dewatering in the Wasatch Formation. Near the coal mines, coal mine dewatering of the Upper Fort Union also has affected groundwater levels in that formation. Groundwater level recovery in the eastern PRB after the cessation of both CBNG development and coal mining, and the effect on groundwater flow paths associated with coal mine pit backfill and reclamation after the cessation of coal mining in the eastern PRB also were modeled and the results are included in the Task 3B Report. For purposes of modeling groundwater recovery, it was assumed that CBNG development in the eastern PRB would cease by 2030 and surface coal mining would cease by 2050 (BLM 2009f).

The Task 3B Report describes the modeled cumulative groundwater impacts associated with ongoing coal-mine-related groundwater withdrawal in the eastern PRB for the time periods of 2010, 2015, and 2020, and the base years used for comparison of groundwater impacts were 2002 (the year used for calibration of the groundwater model) and 1990 (a time period prior to CBNG pumpage and before major expansion by the eastern PRB coal mines). The eastern PRB study area for water resources comprises the Coal Mine Groundwater Model (CMGM) domain as shown in map 4-2 (BLM 2009f). The CMGM was developed specifically for the PRB Coal Review study. The GAGMO databases for 1990 to 2002 were used to calibrate the groundwater model to best reflect conditions in the basin.

The primary objective of the Task 3B Report is to provide an estimate of potential future cumulative impacts on water resources in the eastern PRB of Wyoming because of CBNG development and coal mining for the target years 2010, 2015, and 2020. To accomplish that objective, the Task 3B Report evaluated the potential groundwater impacts due only to coal mine dewatering. The projected locations of coal mine pits from 2002 to 2020 were used for placement of drain cells in the groundwater model that represent pumpage of groundwater by the mines. The amount of water removed by the drain cells reflects calibration to GAGMO monitoring wells surrounding each mine, rather than estimated or recorded discharge rates (BLM 2009f).

Projected groundwater level changes in the Wasatch generally are due to coal mine dewatering and CBNG pumping and discharge, which generally result in local mounding of groundwater in the Wasatch near CBNG fields and drawdown near the coal mines (BLM 2009e). The Wasatch Formation is not a true aquifer in that it has only discontinuous water-bearing sand units not consistent and uniform groundwater level over the eastern PRB; therefore, groundwater level drawdowns because of mining are very localized and in close proximity to the mine operation. For the Upper Fort Union, groundwater level changes are due to CBNG pumpage and coal mine dewatering. Between 2002 and 2020, the projected reduction in coal mine dewatering and the expected reduction in CBNG pumpage from Wright northward toward Gillette are projected to

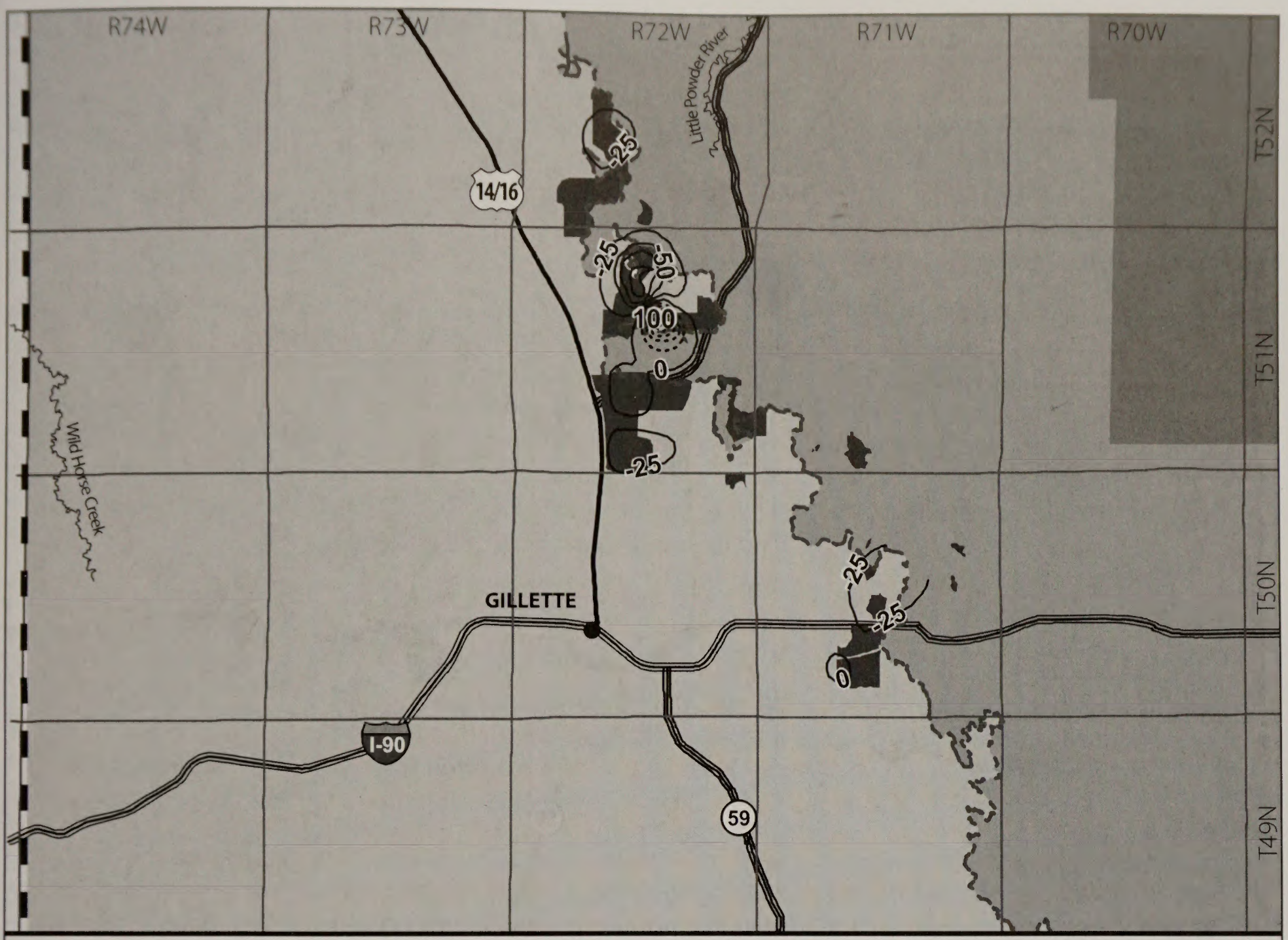
result in a rebound of groundwater levels both within the coal mine boundaries and especially within the basin west of the coal mines (BLM 2009e).

Based on the results of the CMGM, the effect of coal mine dewatering on the Upper Fort Union from 1990 to 2010 in Subregion1 in the area of the Buckskin Mine is a cumulative drawdown ranging from approximately 0 to 25 feet (map 4-3). Using the 2002 baseline data update, it shows a recovery of between 0 and 25 feet to the 1990 level in the 12 years between 1990 and 2002. The 2002 baseline modeling also shows an additional rise in the water level of between 0 and 25 feet from the 2010 level by the year 2015, with no change between 2015 and 2020 of the Upper Fort Union water levels in the area of the Buckskin Mine (map 4-4) (BLM 2009e).

The second issue of concern is the potential for cumulative impacts on groundwater resources because of the proximity of coal mining and CBNG development. The Upper Fort Union (Wyodak) coal is being developed by mining and CBNG production in the same general area. Dewatering activities associated with CBNG development have overlapped with and expanded the area of groundwater drawdown in the coal aquifer in the PRB over what would occur because of coal mining development alone, and this would be expected to continue.

Numerical groundwater flow modeling was used to predict the impacts of the cumulative stresses imposed by mining and CBNG development on the Upper Fort Union Formation coal aquifer in the PRB Oil and Gas Project EIS (BLM 2003). Modeling was necessary because of the large areal extent, variability, and cumulative stresses imposed by mining and CBNG development on the Fort Union coal aquifers. Information from earlier studies was incorporated into the modeling effort for this analysis. As expected, the modeling indicated that the groundwater impacts from CBNG development and surface coal mining would be additive in nature and that the addition of CBNG development would extend the area experiencing a loss in hydraulic head to the west of the mining area. The GAGMO 25-year Report stated that drawdowns in all areas have greatly increased because of the water production from the Wyodak coal aquifer by CBNG producers (Hydro-Engineering 2007).

As previously stated, the updated Task 2 Report (BLM 2009c) defines the projected reasonably foreseeable development scenarios in the PRB for years 2010, 2015, and 2020, and provides the basis for the analysis of potential cumulative impacts in the Task 3 component of the study. The updated Task 3B Report (BLM 2009f) summarizes the modeled changes in groundwater levels projected for 2010, 2015, and 2020 in the eastern PRB within approximately 25 miles of the coal mines. Projected groundwater level changes primarily are due to CBNG groundwater withdrawal in the Upper Fort Union Formation and to both CBNG pumping and discharge along with coal mine pit dewatering in the Wasatch Formation. Groundwater level recovery in the eastern PRB after the cessation of both CBNG development and coal mining, and the effect on groundwater flow paths associated with coal mine pit backfill and reclamation after the cessation of coal mining in the eastern PRB also were modeled and the results are included in that Task 3B Report. For purposes of modeling groundwater recovery, it was assumed that CBNG development in the eastern PRB would cease by 2030 and surface coal mining would cease by 2050 (BLM 2009f).



Coal Mine Groundwater Model (CMGM) Domain

Approximate Wyodak Coal Outcrop

Extent of CMGM Cumulative Drawdown, in feet

Extent of CMGM Cumulative Mounding, in feet

Approximate Coal Mined-out Area through 2006

Wasatch Outcrop Area

Upper Fort Union Outcrop Area

Lower Fort Union Outcrop Area

N

0 5 10

Miles

0 5 10

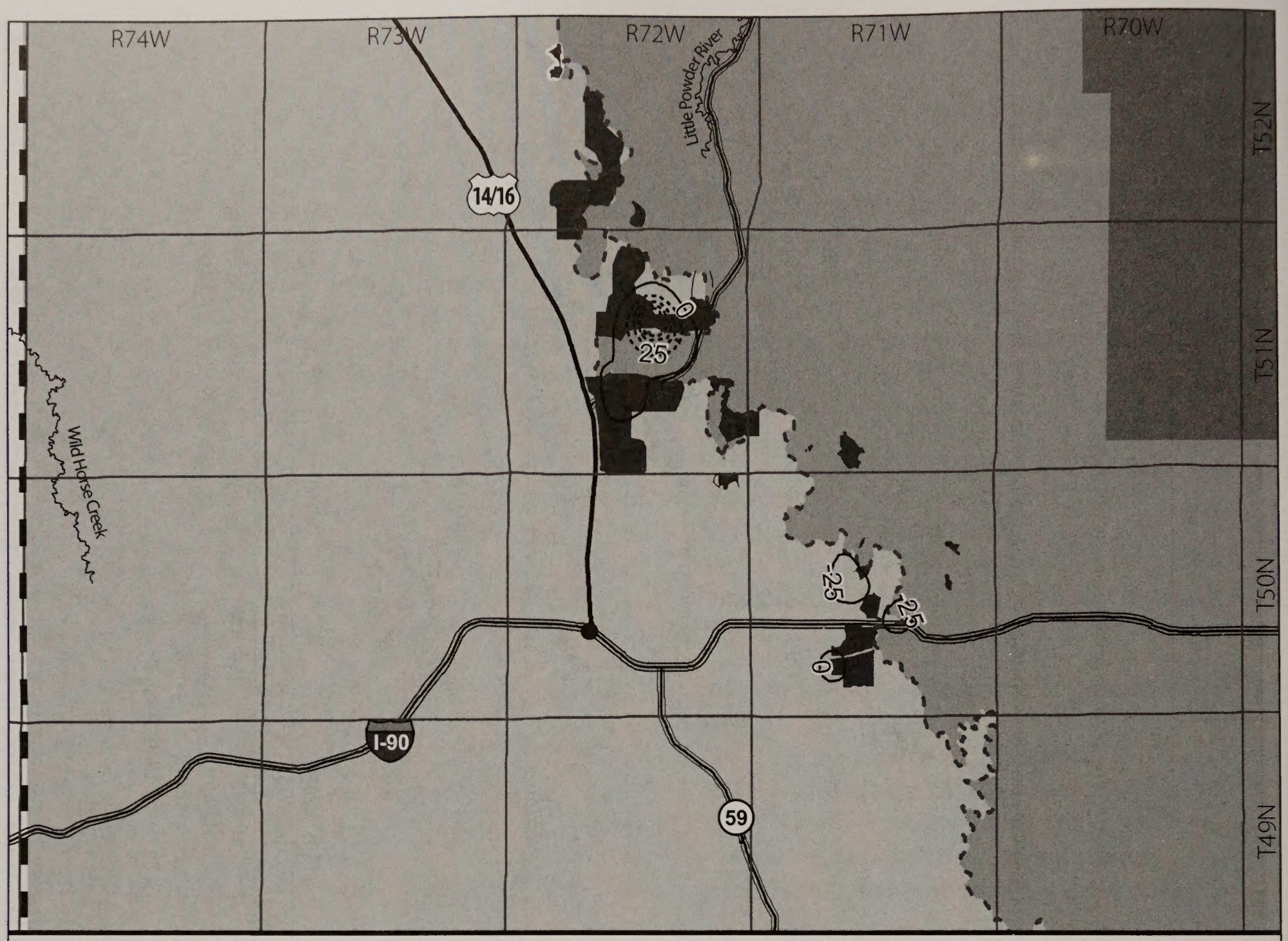
Kilometers

Note: Includes effects of coal mine groundwater pumping only.

No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 4-3

Coal Mine Groundwater Model, Upper Fort Union Formation, Subregion 1—North Gillette
1990–2010 Coal-Mine-Related Groundwater Level Drawdown



Coal Mine Groundwater Model (CMGM) Domain

Approximate Wyodak Coal Outcrop

Extent of CMGM Cumulative Drawdown, in feet

Extent of CMGM Cumulative Mounding, in feet

Approximate Coal Mined-out Area through 2006

Wasatch Outcrop Area

Upper Fort Union Outcrop Area

Lower Fort Union Outcrop Area

N

0 5 10

Miles

0 5 10

Kilometers

Note: Includes effects of coal mine groundwater pumping only.

No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 4-4

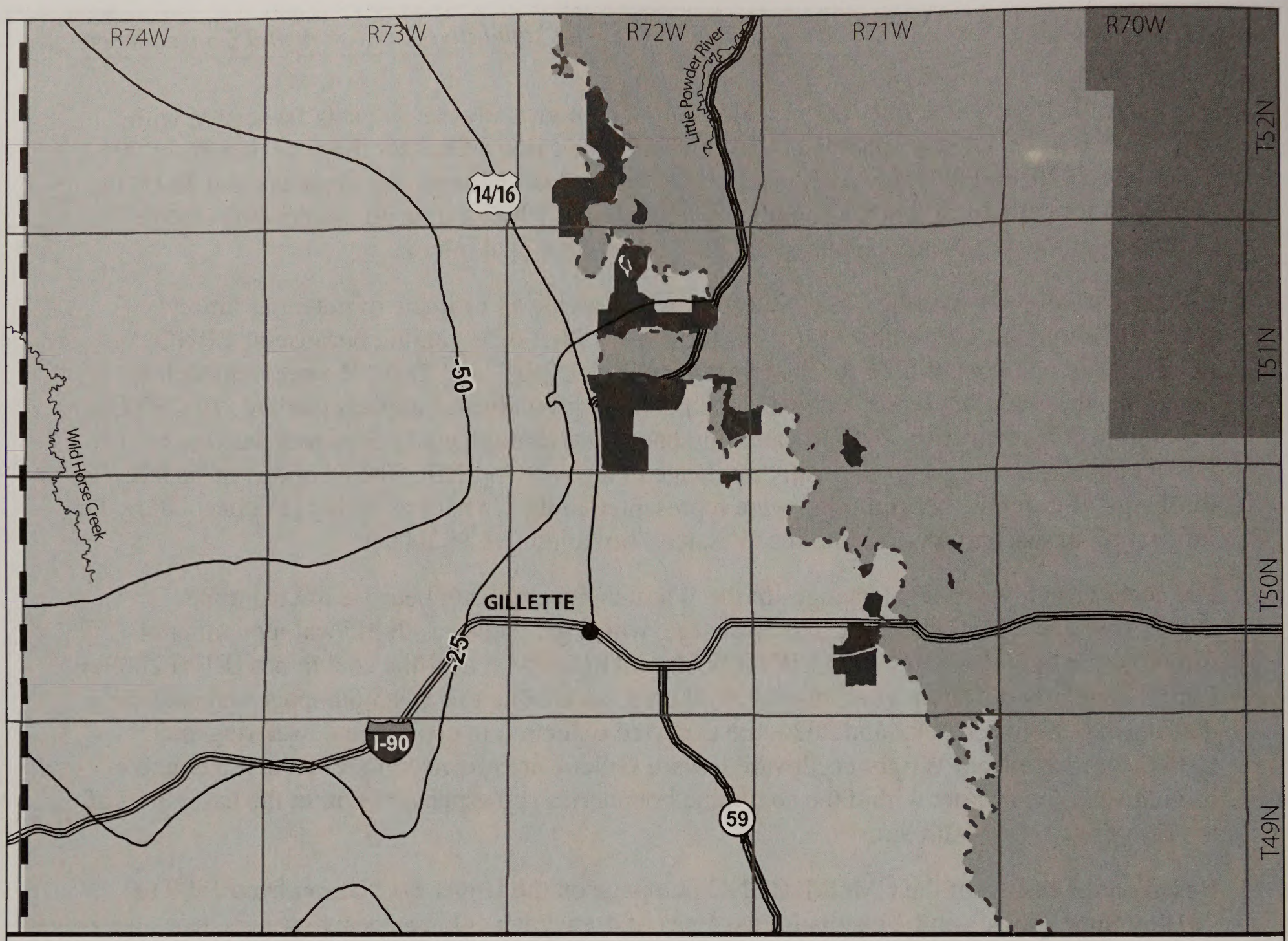
Coal Mine Groundwater Model, Upper Fort Union Formation, Subregion 1—North Gillette
1990–2020 Coal-Mine-Related Groundwater Level Drawdown

The Task 3B Report describes the modeled cumulative groundwater impacts associated with ongoing CBNG-related groundwater withdrawal in the eastern PRB for the time periods of 2010, 2015, and 2020, and the base years used for comparison of groundwater impacts were 2002 (the year used for calibration of the groundwater model) and 1990 (a time period prior to CBNG pumpage and before major expansion by the eastern PRB coal mines).

The primary objective of the Task 3B Report is to provide an estimate of potential future cumulative impacts on water resources in the eastern PRB of Wyoming because of CBNG development and coal mining for the target years 2010, 2015, and 2020. To accomplish that objective, the Task 3B Report evaluated the potential groundwater impacts due only to CBNG development by estimating groundwater pumpage rates through analysis of past patterns in CBNG development and groundwater pumpage in the eastern PRB. The locations of surface discharge of groundwater (outfalls) were represented in the CMGM as recharge cells to allow for infiltration of discharge water into the Wasatch Formation (BLM 2009f).

Projected groundwater level changes in the Wasatch generally are because of coal mine dewatering and CBNG pumping and discharge, which generally result in local mounding of groundwater in the Wasatch near CBNG fields and drawdown near the coal mines (BLM 2009e). For the Upper Fort Union, groundwater level changes are due to CBNG pumpage and coal mine dewatering. Between 2002 and 2020, the expected reduction in coal mine dewatering and CBNG pumpage from Wright northward toward Gillette are projected to result in a rebound of groundwater levels both within the coal mine boundaries and especially within the basin west of the coal mines (BLM 2009e).

Based on the results of the CMGM, CBNG pumpage on the Upper Fort Union from 1990 to 2010 in Subregions 1 and 3 results in two areas of drawdown. One extensive area is in Subregion3, centered just southwest of Wright, and covers nearly 15 townships. Drawdowns in that area range from 25 feet on the southern margin to 575 feet in the center of the depression. The second drawdown area is much smaller and is located in Subregion 1, approximately 10 miles west of Buckskin Mine the mines in this subregion (map 4-5). Drawdowns in this area range from 25 feet on the eastern margin to 50 feet at the Task 3 study area boundary for the water model. The modeled drawdown in the Upper Fort Union because of CBNG pumpage from 1990 to 2015 in Subregion 1 is projected to decrease to between 0 feet and 20 feet, with the center located northwest of the Buckskin Mine and other mines in this subregion by approximately 7 miles. The modeled drawdown in the Upper Fort Union because of CBNG pumpage for the 1990 data set for 2020 in Subregion 1 (map 4-6) is projected to be similar to the 2015 projection. Using the updated 2002 data, Subregion 1 for 2015 the projection is for a rebound of between 0 and 25 feet centered just north of Gillette, Wyoming. For the 2002–2020 projection the model predicts a 0 to 10 foot drawdown in the area north of Gillette, Wyoming, and a rebound of 0 to 10 feet west of Gillette, Wyoming (BLM 2009e).

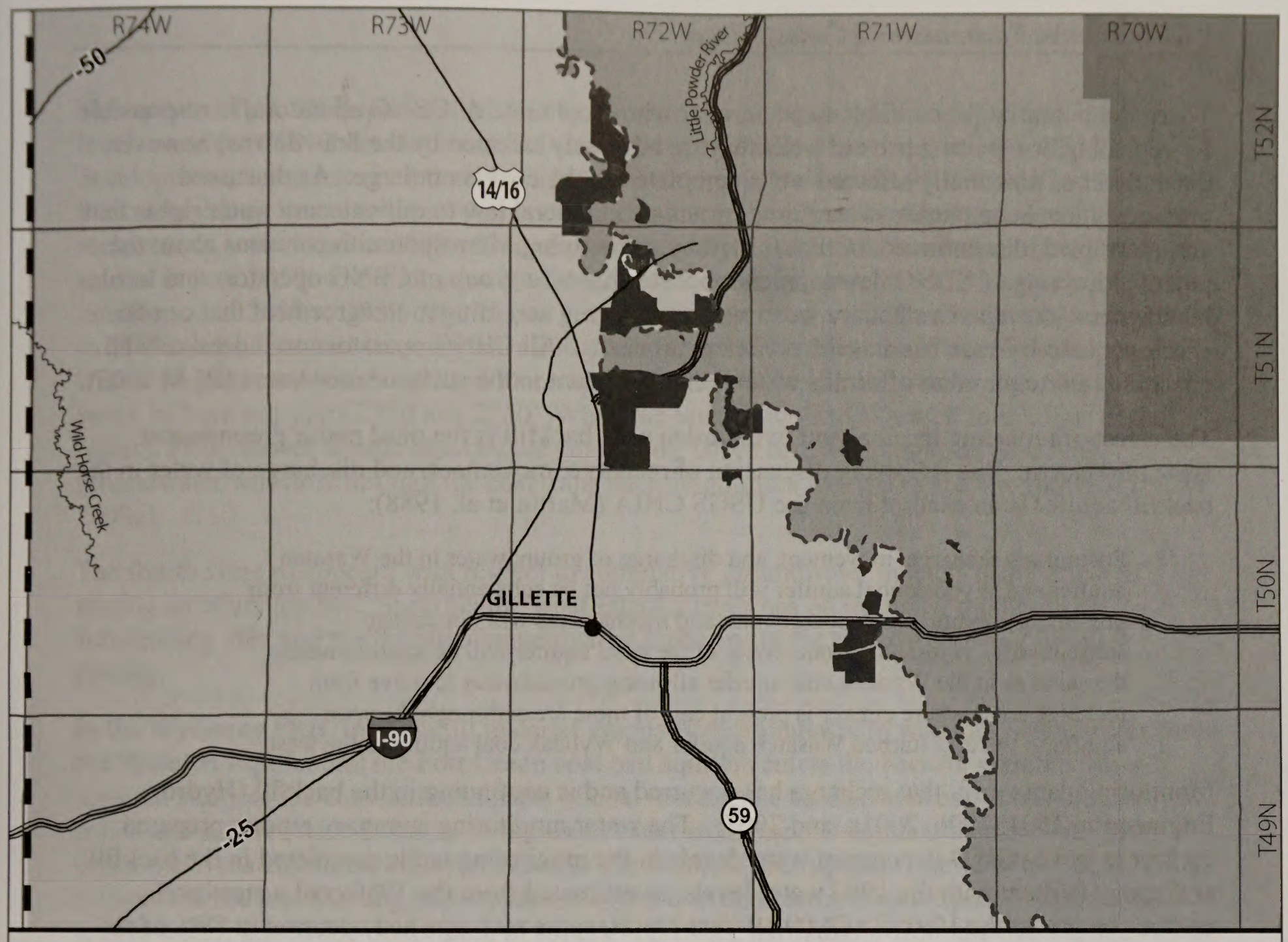


Note: Includes effects of coal mine groundwater pumping only.

No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 4-5

Coal Mine Groundwater Model, Upper Fort Union Formation, Subregion 1—North Gillette
1990–2010 CBNG-Related Groundwater Level Drawdown



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 4-6

Coal Mine Groundwater Model, Upper Fort Union Formation, Subregion 1—North Gillette
1990–2020 CBNG-Related Groundwater Level Drawdown

There is a potential for conflicts to occur over who (coal mine or CBNG operators) is responsible for replacing or repairing private wells that are adversely affected by the drawdowns; however, the number of potentially affected wells completed in the coal is not large. As discussed previously, coal companies are required by state and federal law to mitigate any water rights that are interrupted, discontinued, or diminished by coal mining. In response to concerns about the potential impacts of CBNG development on water rights, a group of CBNG operators and local landowners developed a standard water well monitoring and mitigation agreement that can be used on a case-by-case basis as development proceeds. All CBNG operators on federal oil and gas leases are required to offer this water well agreement to the surface landowners (BLM 2003).

The effect of replacing the coal and overburden with backfill is the third major groundwater issue of concern. The following discussion of recharge, movement, and discharge of water in the backfill aquifer is an excerpt from the USGS CHIA (Martin et al. 1988):

> Postmining recharge, movement, and discharge of groundwater in the Wasatch aquifer and Wyodak coal aquifer will probably not be substantially different from premining conditions. Recharge rates and mechanisms will not change substantially. Hydraulic conductivity of the spoil aquifer will be approximately the same as in the Wyodak coal aquifer allowing groundwater to move from recharge areas where clinker is present east of mine areas through the spoil aquifer to the undisturbed Wasatch aquifer and Wyodak coal aquifer to the west.

Monitoring data verify that recharge has occurred and is continuing in the backfill (Hydro-Engineering 1991, 1996, 2001a, and 2007). The water monitoring summary reports prepared each year by GAGMO list current water levels in the monitoring wells completed in the backfill and compare them with the 1980 water levels, as estimated from the 1980 coal water-level contour maps. In the 1991 GAGMO 10-year report, some recharge had occurred in 88% of the 51 backfill wells reported at that time (Hydro-Engineering 1991). In the GAGMO 20-year report, 79% of the 82 backfill wells measured contained water (Hydro-Engineering 2001a). In the GAGMO 25-year report, 86% of the 101 backfill wells measured contained water (Hydro-Engineering 2007).

The outcrop areas of the Fort Union coal seams are zones of burned coal referred to as clinker (or scoria). These are zones of high secondary permeability and are the main recharge zones for the Fort Union Formation (BLM 2009d). Clinker occurs all along the Wyodak-Anderson coal outcrop on the eastern side of the PRB (Ellis et al. 1999), and is a major groundwater recharge source for the backfill just as it is for the coal aquifer. Some clinker is mined for road-surfacing material, but saturated clinker is not generally mined since abundant clinker exists above the water table and does not present the mining problems that would result from mining saturated clinker. Therefore, the major recharge source for the backfill aquifer is not being disturbed by current mining. Clinker occurs along the eastern edge of the Buckskin Mine, and along the northeastern edge of the Hay Creek II general analysis area.

The cumulative size of the backfill area in the PRB and the duration of mining activity would be increased by mining the currently pending LBA tracts, including the proposed tract or alternative tract configuration. Because the mined-out areas are being backfilled and the monitoring data demonstrate that recharge of the backfill is occurring, substantial additional cumulative impacts are not anticipated as a result of the pending leasing actions.

The updated Task 3B Report (BLM 2009f) summarizes the modeled recovery of groundwater levels once the CBNG development and coal mining operations have ceased. For CBNG development, it was assumed that groundwater pumping in the eastern PRB would end in 2030. For coal mining, it was assumed that open-pit dewatering in advance of mining, as well as mine reclamation, would end in 2050. Groundwater recovery related to the cessation of coal mining started in year 2050, with groundwater discharge rates remaining constant at the projected 2020 rate from year 2020 to 2050. The Upper Fort Union shows recovery after 50 to 100 years (2100 to 2150) and substantial recovery after 200 years (year 2250). Both the Wasatch and Upper Fort Union are projected to rebound and reach approximately 80% of steady-state after 300 to 500 years, or between years 2350 and 2550. When the Fort Union and Wasatch formations of the eastern PRB recover to near steady-state conditions, based on the resaturation modeling, groundwater will flow through the coal mine backfill aquifers and westward into the PRB (BLM 2009e).

The fourth issue of concern with respect to cumulative groundwater impacts is the effect of mining on water quality. Specifically, what effect mining has on the water quality in the surrounding area and the potential water quality problems in the backfill aquifer following mining.

In the Wyoming PRB, the backfill material gradually resaturates with water as groundwater from the Wasatch Aquifer and the Fort Union coal bed aquifers enters the backfill material. In a regional study of the cumulative impacts of coal mining, the median concentrations of dissolved solids and sulfates were found to be higher in water from backfill aquifers than in water from either the Wasatch Formation overburden or the Wyodak coal aquifer (Martin et al. 1988). This is expected because blasting and movement of the overburden materials exposes more surface area to water, increasing dissolution of soluble materials, particularly from the overburden materials that were situated above the saturated zone in the premining environment.

One pore volume of water is the volume of water that would be required to saturate the backfill following reclamation. The time required for one pore volume of water to pass through the backfill aquifer is greater than the time required for the postmining groundwater system to reestablish equilibrium. According to the USGS CHIA, estimates of the time required to reestablish equilibrium range from tens to hundreds of years (Martin et al. 1988).

The major current use of water from the aquifers being replaced by the backfill (the Wasatch Formation overburden and Fort Union coal aquifers) is for livestock because these aquifers are typically too high in dissolved solids for domestic use and well yields are typically too low for irrigation (Martin et al. 1988). Chemical analyses of 336 samples collected between 1981 and 1986 from 45 wells completed in backfill aquifers at 10 mines indicated that the quality of water in the backfill will, in general, meet the state standard for livestock use of 5,000 mg/L for TDS when recharge occurs (Martin et al. 1988).

Water quality samples from coal mine backfill monitor wells along the eastern PRB typically have a pH between 6.0 and 7.8, TDS in the range of 1,000 to 4,000 mg/L, bicarbonate values ranging from 500 to 1,300 mg/L, sodium in the range of 200 to 800 mg/L, high sulfate values ranging from 1,000 to 3,500 mg/L, and SAR values in the range of 2.0 to 7.0 (Hydro-Engineering 2001a). The 2000 Annual GAGMO report (Hydro-Engineering 2001b) evaluated samples from 48 backfill wells in 1999 and found that the TDS in 75% were less than 5,000

mg/L, TDS in 23% were between 5,000 and 10,000 mg/L, and TDS in one well was above 10,000 mg/L. An analysis of about 2,000 samples collected from 95 backfill monitoring wells between 1986 and 2002 found that the water quality in 75% of the wells were within the acceptable range for the Wyoming livestock standard, with 25% exceeding that standard (Ogle 2004).

The WDEQ calculated a median TDS concentration of 3,293 mg/L for the backfill aquifer in the east-central area of the PRB, which includes the four mines located immediately south of Gillette, based on 1,384 samples (Ogle et al. 2005). These results suggest that the TDS in the backfill aquifer in the middle group of mines meets the requirements for livestock use and is similar to TDS found in the undisturbed Wasatch Formation overburden but typically larger than TDS found in the Wyodak coal aquifer.

The 2005 Annual GAGMO Report (Hydro-Engineering 2006) indicates that TDS concentrations in 2005 ranged from 656 mg/L at well RW2804 (at the Belle Ayr Mine) to 12,409 mg/L at well SP-4-NA (at the North Antelope Rochelle Mine). The GAGMO 25-Year Report (Hydro-Engineering 2007) reported samples collected from 57 backfill monitoring wells, and of the last samples that were collected from those wells in 2005, the TDS concentrations ranged from a low of 656 mg/L to and high of 12,409 mg/L, with an average of 3,800 mg/L and a median of 3,670 mg/L. The WDEQ calculated a median TDS concentration of 3,670 mg/L based on 869 samples collected from monitoring wells with at least 15 years of data that are completed in the backfill at the three applicant mines included in this analysis, and concluded that the recovered concentrations will be suitable for post-mining land use (Ogle and Calle 2006). The incremental effect on groundwater quality because of leasing and mining the proposed tract or alternative tract configuration would be to increase the total volume of backfill and, thus, the time for equilibrium to reestablish.

The updated Task 3B Report (BLM 2009f) predicts that resaturation of coal mine pit backfill to form backfill aquifers may take approximately 100 years after cessation of mining and is projected to result in the westward migration of groundwater with elevated TDS levels. Modeling of this westward migration indicates that TDS levels should be down to the average background value of 1,000 mg/L within 2,000 feet of the final westward extent of the coal mine boundaries. Thus, no impact on groundwater quality in either the Wasatch or Upper Fort Union aquifers is expected beyond approximately 2,000 feet west of the final coal mine boundaries (BLM 2009e).

Potential water-level decline in the subcoal Fort Union Formation is the third major groundwater issue. Water level declines in the Tullock Aquifer have been documented in the Gillette area. According to Crist (1991), these declines are most likely attributable to pumpage for municipal use by Gillette and for use at subdivisions and trailer parks in and near the city of Gillette. Most of the water-level declines in the subcoal Fort Union wells occur within 1 mile of the pumped wells (Crist 1991, Martin et al. 1988). Most of the mines have water supply wells completed in zones below the lowest coal seam mined (e.g., subcoal Fort Union Formation and the underlying Lance-Fox Hills aquifer), but the mine facilities in the PRB are separated by a distance of 1 mile or more, so little interference between mine supply wells would be expected (see section 3.5.1.2).

In response to concerns voiced by regulatory personnel, several mines have conducted impact studies of the subcoal Fort Union Formation. The OSM also commissioned a cumulative impact study of the subcoal Fort Union Formation to address the effects of mine facility wells on this aquifer (OSM 1984). Conclusions from these studies may be similar and are summarized as follows.

- Because of the discontinuous nature of the sands in this formation and because most large-yield wells are completed in several different sands, it is difficult to correlate completion intervals between wells.
- In the Gillette area, water levels in this aquifer have probably declined because the city of Gillette and several subdivisions have used water from the formation (Crist 1991). (Note: Gillette is mixing Fort Union Formation water with water from wells completed in the Madison Formation. Also, because drawdown has occurred, some operators are able to dispose of CBNG water by injecting it into the subcoal Fort Union Formation near the city of Gillette.)
- Because large saturated thicknesses are available (locally) in this aquifer unit, generally 500 feet or more, a drawdown of 100 to 200 feet in the vicinity of a pumped well would not dewater the aquifer.

Most of the existing coal mines in the PRB have permits from the Wyoming SEO for subcoal Fort Union Formation water supply wells. Two industrial water supply wells within Buckskin Mine's existing permit area are completed in the Fort Union Formation. Extending the life of the Buckskin Mine by issuing a new lease would result in additional water being withdrawn from the subcoal Fort Union Formation, but no new subcoal water supply wells would be required. The additional water withdrawal would not be expected to extend the area of water level drawdown over a substantially larger area because of the discontinuous nature of the sands in the Tullock Member and the fact that drawdown and yield reach equilibrium in a well because of recharge effects. Because of the distances separating subcoal Fort Union Formation wells used for mine water supply, these wells have not experienced interference and are not likely to in the future.

Water requirements and sources for proposed power plants are not currently known; however, there are no proposed power plants in the immediate vicinity of the Buckskin Mine. The Wyoming SEO is discouraging further development of the lower Fort Union Formation aquifers, so the most likely groundwater source for future power plants is the Lance-Fox Hills Aquifer System. This would reduce the chances that the power plants would add to cumulative hydrologic impacts of mining and CBNG production.

4.2.4.2 Surface Water

The Powder River structural basin of Wyoming, often referred to as the PRB, encompasses five major drainages. The drainages in the northern portion of the basin include the Powder River, Tongue River, and Little Powder River. In the central and southern parts of the basin, the major drainages are the Belle Fourche and Cheyenne rivers. Surface water flows to the north into Montana in the northern part of the basin and to the east-northeast into South Dakota in the southern and central parts of the basin. The discussion of water resources in the PRB focuses on two main issues: 1) current water use in the basin and 2) industrial use of water resources by the coal mines and CBNG industries. The discussion of water use in the PRB Coal Review for the

Wyoming PRB is divided into two major water planning areas: the Powder/Tongue River Basin and the Northeast Wyoming River Basins (BLM 2009d).

The main rivers in the Powder/Tongue River Basin are the Tongue River and the Powder River. The basin receives substantial surface water runoff from the Big Horn Mountains, leading to major agricultural development along drainages in the Powder/Tongue River Basin. Reservoirs are used throughout the basin for agricultural water supply and for municipal water supply in the Powder/Tongue River Basin. Water use in the Powder/Tongue River Basin as of 2002 is summarized in table 4-16.

Table 4-16. Water Use as of 2002 in the Powder/Tongue River Basin (acre-feet per year)

Water Use Categories	Dry Year		Normal Year		Wet Year	
	Surface	Ground	Surface	Ground	Surface	Ground
Agricultural 178,	000	200	184,000	200	194,000 300	
Municipal 2,70	0	500	2,700	500	2,700	500
Domestic —		4,400	—	4,400	--	4,400
Industrial[a] —		68,000	—	68,000	—	68,000
Recreation Non-c	onsumptive					
Environmental Non-c	onsumptive					
Evaporation 11,3	00	—	11,300	—	11,300	—
Total 192,	000	73,100	198,000	73,100	208,000	73,200

[a] Includes conventional oil and gas production water and CBNG production water.

Source: HKM Engineering et al. 2002a.

The Little Bighorn River, Tongue River, Powder River, Crazy Woman Creek, and Piney Creek carry the largest natural flows in the Powder/Tongue River Basin. Many of the other major drainages are affected by irrigation practices to the extent that their flows are not natural (HKM Engineering et al. 2002a). Water availability in the major subbasins of the Powder/Tongue River Basin is summarized in table 4-17. This table presents the amount of surface water in acre-feet that is physically available above and beyond allocated surface water in these drainages. As a result of the Yellowstone River Compact, Wyoming must share some of the physically available surface water in the Powder/Tongue River Basin with Montana.

Table 4-17. Surface Water Availability in the Powder/Tongue River Basin (acre-feet per year)

Subbasin	Surface Water Availability		
	Wet Years	Normal Years	Dry Years
Little Bighorn River	152,000	113,000	81,000
Tongue River	473,000	326,000	218,000
Clear Creek	213,000	124,000	80,000
Crazy Woman Creek	69,000	32,000	16,000
Powder River	547,000	324,000	16,000
Little Powder River	48,000	12,000	3,000
Total 1,50	2,000	931,000	414,000

Source: HKM Engineering et al. 2002a.

The main rivers in the Northeast Wyoming river basins are the Belle Fourche in Campbell and Crook counties and the Cheyenne River in Converse, Weston, and Niobrara counties. Water in these rivers and their tributaries comes from groundwater baseline flow and from precipitation, especially from heavy storms during the summer months. Most surface flow in Northeast Wyoming River Basins is intermittent to ephemeral and streamflows are typically dominated by irrigation practices to the extent that their flows are unnatural (HKM Engineering et al. 2002a). Water use in the Northeast Wyoming river basins as of 2002 is summarized in table 4-18.

Table 4-18. Water Use as of 2002 in the Northeast Wyoming River Basins

Water Use Categories	Dry Year		Normal Year		Wet Year	
	(acre-feet per year)					
	Surface	Ground	Surface	Ground	Surface	Ground
Agricultural	65,000	11,000 6	9,000	17,000	71,000 1	7,000
Municipal —		9,100	—	9,100	—	9,100
Domestic —		3,600	—	3,600	—	3,600
Industrial[a] —		46,000	—	46,000	—	46,000
Industrial (Other)[b] —		4,700	—	4,700	—	4,700
Recreation Non-c	onsumptive					
Environmental Non-c	onsumptive					
Evaporation (Key Reservoirs)	14,000 —		14,000	—	14,000	—
Evaporation (Stock Ponds)	6,300	—	6,300	—	6,300	—
Total	85,300	74,400 8	9,300	80,400	91,300 8	0,400

[a] Includes conventional oil and gas production water and CBNG production water.

[b] Includes electricity generation, coal mining, and oil refining.

Source: HKM Engineering et al. 2002b.

Stream flow in the major drainages of the Northeast Wyoming River Basins is much less than in the Powder/Tongue River Basin due to the absence of a major mountain range to provide snow melt runoff. Water availability in the major subbasins of the northeast Wyoming river basin is summarized in table 4-19.

Table 4-19. Surface Water Availability in the Northeast Wyoming River Basins

	Surface Water Availability (acre-feet per year)		
Subbasin	**Wet Years**	**Normal Years**	**Dry Years**
Redwater Creek	34,000 26,0	00 17,0	00
Beaver Creek	30,000 20,0	00 14,0	00
Cheyenne River	103,000	31,000	5,000
Belle Fourche River	151,000	71,000	13,000
Total 318,	000	148,000	49,000

Source: HKM Engineering et al. 2002b.

The updated Task 3B Report (BLM 2009f) summarizes the modeled changes in surface water quality as a result of CBNG, conventional oil and gas, and surface coal mining development projected for 2010, 2015, and 2020 in the eastern PRB within approximately 25 miles of the coal mines. The base year used for comparison of surface water quality impacts was 2003. A stream channel stability analysis was also conducted to evaluate the potential effects to stream channels because of projected CBNG production water discharge. The surface water resources in the Task 3 study area consist primarily of intermittent and ephemeral streams and scattered ponds and reservoirs. A major impact of the projected development activities would be direct surface disturbance of these surface water features. Projected cumulative surface water impacts primarily include the impacts of CBNG production water discharge to ephemeral drainages and the surface disturbance and subsequent reclamation of drainages that result from coal mine expansion.

Surface water quality impacts for target years 2010, 2015, and 2020 were estimated using a linear model developed by Anderson Consulting Engineers (2009) and the projected water discharge volumes presented in the updated Task 2 Report (BLM 2009c). Projected changes in surface water quality are due to mixing of predicted CBNG production water discharge with natural flow in the modeled drainages. For CBNG discharge, the direct discharge to ephemeral drainages for each drainage basin was used as a guide for modeling water quality or estimating impacts on channel stability and channel properties. For the coal mines, most of the water produced was expected to be consumed, according to estimates provided by the mine operators and included in that Task 2 Report. Where production exceeded estimated consumption for the coal mines in any given drainage basin, it was assumed that the discharged water would go first to holding ponds and then to nearby ephemeral drainages in accordance with Wyoming Pollution Discharge Elimination System permits, thereby minimizing the potential for degradation of water quality and impacts on channel stability.

Table 4-10 summarizes the cumulative baseline (2003), actual (2007), and projected (in 2010, 2015, and 2020) acres of surface disturbance and reclamation. The projected activities would result in surface disturbance in each of the six subwatersheds in the study area (map 4-2). Discrete locations for development disturbance and reclamation areas cannot be determined based on existing information. However, the projected disturbance would primarily involve the construction of additional linear facilities, product gathering lines, and road systems associated with conventional oil and gas and CBNG activities, plus additional disturbance associated with extending coal mining operations onto lands adjacent to the existing mines.

Surface-disturbing activities can result in sediment input to local water bodies. This affects the water quality parameters such as turbidity and bottom substrate composition. Contaminants also can be introduced into water bodies through chemical characteristics of the sediment. Studies have shown that TDS levels in streams near reclaimed coal mine areas have increased from 1% to 7% (Martin et al. 1988). Typically, sedimentation effects are short-term in duration and localized in terms of the affected area. Suspended sediment concentrations would stabilize and return to typical background concentrations after construction or development activities have been completed. It is anticipated that sediment input associated with development disturbance areas would be minimized by implementing appropriate erosion control measures, as would be determined during future permitting.

Future coal mining could remove intermittent or ephemeral streams and stockponds in the Little Powder River, Upper Belle Fourche River, Upper Cheyenne River, and Antelope Creek subwatersheds. As discussed in section 3.5.2, the Buckskin Mine is in the Little Powder River subwatershed. Coal mine permits provide for removal of first- through fourth-order drainages. During reclamation, third- and fourth-order drainages must be restored; first- and second-order drainages often are not replaced (Martin et al. 1988).

Coal-mining-related surface water would be discharged into intermittent and ephemeral streams in four subwatersheds (Antelope Creek, Little Powder River, Upper Belle Fourche River, and Upper Cheyenne River). Based on current trends, it is assumed that most, if not all, of the coal-mine-produced water would be consumed during operation. As discussed in section 3.5.2.2, changes in surface runoff would occur as a result of the destruction and reconstruction of drainage channels as mining progresses. Sediment control structures would be used to manage discharges of surface water from the mine permit areas. State and federal regulations require treatment of surface runoff from mined lands to meet effluent standards.

Of particular importance is the amount of production water that is directly conveyed to the receiving drainages. Based on information and data presented in the updated Task 1B and Task 2 reports (BLM 2009e and 2009b, respectively), it is assumed that the production water discharged directly to the receiving drainages would be limited to CBNG water discharge. The PRB Coal Review assumes that future permitting would allow a portion of CBNG-produced water to be discharged to intermittent and ephemeral drainages as is currently allowed in the six subwatersheds in the study area (Antelope Creek, Dry Fork Cheyenne River, Upper Cheyenne River, Upper Belle Fourche River, Upper Powder River, and Little Powder River) (map 4-2).

The Task 3B Report (BLM 2009f) uses the surface water model described in the Surface Water Quality Analysis Technical Report (Greystone and ALL Consulting 2003), which was prepared in support of the PRB Oil and Gas Project EIS (BLM 2003), to evaluate the cumulative impacts

on surface water quality from surface discharge of CBNG development. The linear model used by Anderson Consulting Engineers (2009) to predicted future cumulative surface water quality impacts combined stream flows and stream water quality with the predicted CBNG discharge water quantity and quality for each subwatershed for 2010, 2015, and 2020, and the base year for comparison for surface water quality impacts was 2003.

Based on past monitoring in receiving streams, most CBNG discharge water (70–90%) either infiltrates or evaporates within a few miles of the discharge points and generally is not recorded at USGS stream gauge stations. Impacts on surface water flow and quality are, therefore, generally limited to within a few miles of the discharge point. In view of this, the updated Task 3B water quality impact analysis assumes a conveyance loss of 70% for the water quality assessment and modeling analysis.

Key water quality parameters for predicting the potential effects of CBNG development in the surface water quality impact analysis focused on the suitability of surface water for agricultural irrigation. Consequently, the SAR, and salinity, measured by electrical conductivity (EC), were used for this prediction. SAR is a measure of the amount of sodium in the water that can react with clays and, thus, reduce infiltration into soils and the ultimate use of the soil for growing crops. EC is a measure of the total dissolved solids. The most restrictive proposed limit (MRPL) and least restrictive proposed limit (LRPL) regulatory standards for EC and SAR are set for each subwatershed by the WDEQ in conjunction with neighboring states that receive flow across state boundaries from the specified stream in the watershed. These limits refer to the desired concentrations for SAR and EC and are used as guidelines for evaluating potential impacts on water quality. The limits presented in table 4-20 were used during the comparison of EC and SAR values for resulting mixtures of existing streamflows and discharges from CBNG wells under various flow conditions and reasonably foreseeable development projections for 2010, 2015, and 2020.

Table 4-20. Summary of Proposed Limits for Sodium Absorption Ratios and Electrical Conductivity

	Most Restrictive Proposed Limit (MRPL)		Least Restrictive Proposed Limit (LRPL)	
Subwatershed	SAR	EC (µS/cm)	SAR	EC (µS/cm)
Little Powder	5.00	2,000	9.75	2,500
Upper Powder	2.00	2,000	9.75	2,500
Belle Fourche	6.00	2,000	10.00	2,500
Cheyenne River & Antelope Creek	10.00 2,00	0	10.00	2,500

SAR = sodium absorption ratio; EC= electrical conductivity; µS/cm = microsiemens per centimeter

Source: Wyoming DEQ, Montana DEQ, and South Dakota Legislative Council.

The cumulative impacts on surface water quality focused on reasonably foreseeable development scenarios for normal and dry year conditions to show the difference based on streamflow and climate. Wet years were not analyzed because increased runoff and stream flow would result in potential water quality impacts considerably less than normal and dry year reasonably foreseeable development scenarios. The impact analysis, conducted using monthly flows,

comparatively evaluated the water quality parameters (SAR and EC) of the receiving drainage before and after mixing with discharge water generated by the CBNG wells within that drainage. In general, the water discharged from the CBNG wells reflected increased levels of SAR and reduced levels of EC compared to the water quality of the receiving drainages. Impacts on water quality are likely to be maximized during the low flow months; consequently, the comparative evaluation of water quality also focused on the minimum monthly flow associated with the dry year and normal year conditions.

The water quality impact analysis made several observations regarding the overall effects of mixing CBNG well production water with surface water in the PRB Coal Review study area. These general observations are summarized below.

Normal Year Conditions

Antelope Creek. Before mixing, the SAR values are relatively low and do not exceed the MRPL. The EC values exceed the MRPL during the low-flow months, but are typically less than the LRPL all year. After mixing, from 2003 to 2020, EC is projected to decline, and SAR values are projected to increase. The data indicate that the MRPL and LRPL would not be exceeded for either EC or SAR after mixing or CBNG production waters. Based on the data, surface water is projected to be suitable for irrigation use in all months.

Dry Fork of the Cheyenne River. Before mixing, the SAR values are relatively low and do not exceed the MRPL. The EC values exceed the MRPL during the low-flow months, but are typically less than the LRPL all year. There is no projected discharge of CBNG production water to the drainage through 2020. Therefore, surface water quality conditions for 2010, 2015, and 2020 would be the same as for the base year (2003).

Upper Cheyenne River. Before mixing, the SAR levels do not exceed the MRPL and the EC levels exceed the MRPL for 11 months of the year and the LRPL for 9 months of the year. After mixing, from 2003 to 2010, EC is projected to decrease, and SAR values would not change. There is no projected discharge of CBNG production water to the drainage in 2015 and 2020. Based on the data, EC values would exceed the MRPL, except for August 2010, and exceed the LRPL, except for July through September 2010. SAR values would not exceed the MRPL and LRPL. Based on the data, surface water would remain suitable for irrigation from 2010 to 2020.

Upper Belle Fourche. Before mixing, the SAR levels exceed the MRPL from November through January while meeting the LRPL throughout the year. The EC levels exceed the MRPL from September through January and exceed the LRPL from November through January. After mixing, from 2003 to 2015, EC is projected to decline and SAR is projected to increase slightly. There is no projected discharge of CBNG production water to the drainage in 2020; therefore, EC and SAR values for this time period would be the same as projected for the base year (2003). The data indicate that EC would not exceed the MRPL, except for October in 2010 and October through January in 2015, and would not exceed the LRPL. The projected SAR values would exceed the MRPL from August to January in 2010 and from September to January 2015, and would not exceed the LRPL for all months. Based on the data, surface water is projected to be suitable for irrigation to 2020.

Upper Powder River. Before mixing, surface water in the Upper Powder River exceeds the MRPL for both EC and SAR throughout the majority of the year. Levels of SAR are less than the LRPL while EC values generally exceed the LRPL from July through December. After mixing, from 2003 to 2015, EC is projected to decrease slightly, and SAR values would increase slightly. There is no projected discharge of CBNG production water to the drainage in 2020; therefore, EC and SAR values for this time period would be the same as projected for the base year (2003). The data indicate that EC values would exceed the MRPL, except for May and June for 2010 and 2015, and would exceed the LRPL during July through December from 2010 to 2015. SAR values would exceed the MRPL, except for March in 2010 and 2015 and May in 2015, and would not exceed the LRPL. Based on the data, surface water is projected to remain suitable for irrigation from 2010 to 2015.

Little Powder River. Before mixing, the surface water in the Little Powder River exceeds the MRPL for EC and SAR throughout the majority of the year. SAR levels remain below the LRPL throughout the year, but EC levels exceed the LRPL during the low flow months. After mixing, from 2003 to 2020, EC is projected to increase slightly. The data indicate that EC values would exceed the MRPL except for March and May during 2010, and March during 2015 and 2020; however, it would not exceed the LRPL except for January and August from 2010 to 2020, and also in September, November, and December from 2015 to 2020. SAR values are projected to exceed the MRPL and not exceed the LRPL. Based on the data, surface water is projected to remain suitable for irrigation to 2020.

Dry Year Conditions

Antelope Creek. After mixing, from 2003 to 2020, EC values would be reduced because of mixing with CBNG waters and SAR values would increase. The data indicate that the MRPL and LRPL would not be exceeded for either EC or SAR for all years. Based on the data, surface water would remain suitable for irrigation except for June and August from 2010 to 2020.

Dry Fork of the Cheyenne River. There is no projected discharge of CBNG production water to the drainage through 2020. Therefore, surface water quality conditions would be the same as for the base year (2003).for all years to 2020.

Upper Cheyenne River. After mixing, from 2003 to 2010, EC values would decline, and SAR values would increase slightly. There is no projected discharge of CBNG production water to the drainage in 2015 and 2020. EC values would exceed the MRPL except for August 2010; the LRPL would be exceeded except for July to September 2010. For SAR, neither the MRPL nor the LRPL would be exceeded. Based on the data, surface water would remain suitable for irrigation to 2020.

Upper Belle Fourche. After mixing, from 2003 to 2015, EC values would decline, and SAR values would increase slightly. There is no projected discharge of CBNG production water to the drainage in 2020. EC values would not exceed the MRPL or LRPL from 2010 to 2015. SAR values would exceed the MRPL in 2010, except for March and July, and also would exceed the MRPL from August to January 2015. Based on the data, surface water would be unsuitable for irrigation from August to October during 2010 and in October 2015.

Upper Powder River. After mixing, from 2003 to 2015, EC vales would decrease slightly, and SAR values would increase slightly. There is no projected discharge of CBNG production water

to the drainage in 2020. EC values would exceed the MRPL except for the months of May and June 2010 and 2015, and the LRPL would be exceeded July through December for 2010 and 2015. SAR values would exceed the MRPL, except for May and June 2015, and would not exceed the LRPL for all years. Based on the data, surface water would remain suitable for irrigation to 2020.

Little Powder River. After mixing, from 2003 to 2020, the EC would be reduced and the SAR would increase. The MRPL would be exceeded for all years for EC during the months of February, April, June, and August in 2010; during November through February and during April, June, and August in 2015; and all months except March in 2020. EC values would exceed the LRPL in September 2010; August 2015; and January, August November, and December 2020. SAR values would exceed the MRPL in all months and years except March 2015 and March and May 2020. The LRPL for SAR would be exceeded in September 2010. The water would remain suitable for irrigation from 2010 to 2020 except for September and October 2010.

In summary, the suitability of the mixed water for irrigation purposes is related to EC and SAR. In general, the water most suitable for irrigation has a relatively low SAR and a relatively high EC. Elevated SAR values may reduce permeability in clayey soils, which reduces the rate of water infiltration. As discussed above, the water discharged from the CBNG wells is generally characterized by higher levels of SAR and reduced levels of EC compared to the water quality of the receiving drainages. In those cases where mixing results in a significant increase in SAR and the EC is moderately low, the water was considered unsuitable. For these six drainages, the projected water quality after mixing demonstrated adequate suitability for irrigation in most months during normal year conditions. The MRPL and LRPL may be exceeded for EC and SAR in 1 or more years and in any given year for 1 or more months, but not for all months in the year. During dry year conditions, the suitability of surface waters in the six drainages for irrigation generally would be reduced because of the greater percentages of CBNG water in the drainage after mixing. Both the EC and SAR values would exceed the MRPL and LRPL more frequently compared to normal year flows. Even though the waters' suitability for irrigation would be reduced (except for the Belle Fourche River) surface water generally would remain suitable for irrigation during the majority of months of the irrigation season.

4.2.5 Channel Stability

In general, cumulative impacts on channel stability largely relate to changes in water quantity associated with discharges from existing and projected development activities as compared to the natural runoff characteristics of the receiving drainages. For this evaluation, Anderson Consulting Engineers (2009) assumed that water discharged directly to the receiving drainages would be limited to CBNG activities, which are projected to be the primary source of discharge water in the PRB hydrologic study area (see fig 4-2) through 2020.

To the extent possible, the impact on perennial drainages was addressed quantitatively at the subwatershed level using regression equations related to discharge and channel width. Geomorphic relationships between mean annual discharge, channel gradient and geometry, bed load, and median sediment size also were used to provide a qualitative assessment of potential impacts associated with the discharge of CBNG production water.

To have an impact on channel stability that is manifested in active channel erosion, CBNG production water discharge likely would have to represent a substantial portion of the channel-forming discharge in watersheds where the channel slope is steep enough and the width, depth, and sinuosity low enough to impact channel morphology. Channel-forming discharge was estimated using the peak annual discharge recurrence interval and the common range for channel-forming discharge between the 1.5- to 2.0-year recurrence interval. Based on the magnitude of the projected CBNG production water discharges compared to the channel-forming discharge (1.5- to 2.0-year recurrence interval), the impact more likely would be evident in small ephemeral drainages that are characterized by steep channel gradients, lower sinuosity, and smaller widths and depths. Overall, as the drainage area increases, the channel slope typically decreases along with an increase in sinuosity, thereby reducing the impact of CBNG production water discharge on channel stability.

The channel-forming discharge for both the Little Powder River and Belle Fourche River is given in table 4-21. The perennial stream evaluation calculated the change in channel width for the Little Powder River as less than 0.3%. For the Belle Fourche River, it was calculated to be less than 0.2% (table 4-21) (Anderson Consulting Engineers 2009). Given the low increase in mean annual discharge from introduced CBNG water, changes in channel geomorphology (width, depth, gradient, bed material transport and meander wavelength) are considered imperceptible. These results suggest that for the larger perennial streams the effect of CBNG production water discharge would be minimal

Table 4-21. Impact of CBNG Production Water on Perennial Streams

Location	Channel Forming Discharge[a] (cfs)	CBNG Discharge (cfs)	CBNG Discharge (%)	Estimated Width (feet) Existing Conditions	Estimated Width (feet) Combined Discharge	Potential Impact (Increased Channel Width) (feet)	Potential Impact (Increased Channel Width) (%)
Little Powder River above Dry Creek near Weston, Wyoming (USGS Gage 06324970)	270 to 420	2.2	0.5 to 0.8	47.3 to 56.3	47.4 to 56.4	0.15 to 0.12	0.3
Belle Fourche River below Moorcroft, Wyoming (USGS Gage 06426500)	652 to 789	3.9	0.5 to 0.6	66.9 to 72.1	67.0 to 72.2	0.16 to 0.14	0.2

cfs = cubic feet per second

[a] Discharge associated with the 1.5- to 2-year recurrence interval.

Discharge of CBNG well production water into ephemeral drainages may start or exacerbate erosion in the ephemeral stream channel. Given the potentially greater increase in stream flow due to a lower natural flow, channel geomorphology is more likely to be perceptible. Smaller drainages may be more likely to exhibit channel erosion depending on the magnitude of the flow contribution from CBNG water production compared to the channel-forming discharge. However, field observations in these watersheds found an increase in vegetation diversity and density along the channel.

In the updated Task 3B Report (BLM 2009f), there is a discussion of a special study that was done of the Caballo Creek drainage in the Belle Ayr Mine permit area, to see how reclaimed

drainages were affected by increased CBNG discharges. It was determined that CBNG discharge represented less than 1% of the two-year peak discharge. No active erosion was noted in the natural or diverted portions of the Caballo Creek channel, while an increase in vegetative diversity and density was noted. Based on the relative magnitude of the flow contribution from CBNG production water discharge to the flow in Caballo Creek, the minor amount of flow increase would not likely result in increased erosion to its channel or in streams similar to Caballo Creek. While it is more likely that creeks with smaller drainage areas, like Duck Nest or Bone Pile creeks may experience more erosion because of relatively larger flow increases from CBNG discharge, such effects were not observed in the field (BLM 2009e).

4.2.6 Alluvial Valley Floors

The identified AVFs for all coal mines in the PRB Coal Review study area are described in the 2005 Task 1D Report (BLM 2005e), and are based on individual mine state decision documents. Regulatory determinations of AVF occurrence and location are completed as part of the permitting process for coal mining operations, because their presence can restrict mining activities under SMCRA and Wyoming laws. The WDEQ administers the AVF regulations for coal mining activities in Wyoming. Coal-mine-related impacts on designated AVFs generally are not permitted if the AVF is determined to be significant to agriculture. If an AVF is determined not to be significant to agriculture or if the permit to affect the AVF was approved prior to the effective date of SMCRA, the AVF can be disturbed during mining but must be restored to essential hydrologic function during reclamation.

The formal AVF designation and related regulatory programs described above are specific to coal mining operations; however, other development-related activities in the study area would potentially impact AVF resources. The portions of the PRB Coal Review study area that lie outside of the mine permit areas have generally not been surveyed for the presence of AVFs; therefore, the locations and extent of the AVFs outside of the mine permit areas have not been determined. No AVFs are present in the Hay Creek II general analysis area.

4.2.7 Soils

The updated Task 3D Report (BLM 2009g) discusses potential cumulative impacts on soils from projected development activities in the study area for that report. The area of actual surface coal mining disturbance and reclamation for 2003 and 2007 and the projected cumulative areas of disturbance and reclamation for 2010, 2015, and 2020 are shown in table 4-2 and table 4-3. The area of actual disturbance and reclamation for all development in 2003 and 2007 and the projected cumulative total areas of disturbance and reclamation for 2010, 2015, and 2020 are shown in table 4-10.

Development activities such as increased vehicle traffic, vegetation removal, soil salvage and redistribution, discharge of CBNG produced groundwater, and construction and maintenance of project-specific components (e.g., roads, rights-of-way, well pads, industrial sites, and associated ancillary facilities) would result in cumulative impacts on soils in the study area. In general, soil disturbance and handling from these activities would generate both long-term and short-term impacts on soil resources through accelerated wind or water erosion, declining soil quality factors, compaction, and the removal and replacement of soil resources at mining sites.

Of the types of development projects in the study area, coal mining activities would create the most concentrated cumulative impacts on soils. This is due to the large acreages involved and the tendency of mining operations to occur in contiguous blocks. These factors would encourage widespread accelerated wind and water erosion. Extensive soil handling would cause compaction and a corresponding loss of permeability to water and air; a decline in microbial populations, fertility, and organic matter; and potential mixing of saline and alkaline soil zones into seedbeds, which would reduce soil quality. There would be a limited availability of suitable soil resources for reclamation uses in some areas.

However, for surface coal mining operations, there are measures that are either routinely required or can be specifically required as necessary to reduce impacts on soil resources and to identify overburden material that may be unsuitable for use in reestablishing vegetation, as discussed in sections 3.3.1.3, 3.4.2.3, and 3.8.3.

As described in appendix E of the updated Task 2 Report (BLM 2009c), a variety of CBNG water disposal methods may be employed in the Task 3 study area. The potential impacts on soils would depend on the water treatment method, if any, and the nature of the disposal method. As discussed in the 2005 Task 3D Report (BLM 2005f), because of elevated SAR levels in water produced from the Wyodak-Anderson coal zone in the Upper Powder River and Little Powder River subwatersheds, land applications of CBNG-produced water in those areas could increase soil alkalinity. As discussed above in section 4.2.4.2, the SAR values are generally low for the Little Powder River subwatershed and tend to exceed the MRPL after mixing with discharged CBNG water during six months of the year while meeting the LRPL throughout the year. Land application of CBNG-produced water is not anticipated in this area. The specific approaches to CBNG water discharges, the resource conditions and locations in which they occur, the timing of discharges, and the discharge permit stipulations from regulatory and land management agencies would determine the extent and degree of potential impacts on soils.

4.2.8 Vegetation, Wetlands, and Riparian Areas

The updated Task 3D Report (BLM 2009g) discusses potential cumulative impacts on vegetation, wetlands, and riparian areas from projected development activities in the Task 3 study area. The area of actual surface coal mining disturbance and reclamation for 2003 and 2007 and the projected cumulative areas of disturbance and reclamation for 2010, 2015, and 2020 are shown in table 4-2 and table 4-3. The area of actual disturbance and reclamation for all development, in 2003 and 2007, and the projected cumulative total areas of disturbance and reclamation for 2010, 2015, and 2020 are shown in table 4-10.

4.2.8.1 Vegetation

The PRB is characterized as a mosaic of general vegetation types, including prairie grasslands, shrublands, forested areas, and riparian areas. These broad categories often represent several vegetation types that are similar in terms of dominant species and ecological importance. Fourteen vegetation types were identified within the Task 1 study area, of which 10 primarily consist of native vegetation and are collectively classified as rangeland. These vegetation types include short-grass prairie, mixed-grass prairie, sagebrush shrubland, other shrubland, coniferous forest, aspen, forested riparian, shrubby riparian, herbaceous riparian, and wet meadow. The remaining vegetation types support limited or non native vegetation and include cropland,

urban/disturbed, barren, and open water. The vegetation types are described in more detail in the 2005 Task 1D Report (BLM 2005e).

Impacts on vegetation can be classified as short-term and long-term. Potential short-term impacts arise from removing and disturbing herbaceous species during a project's development and operation (e.g., coal mining, CBNG drilling and production), which would cease upon project completion and successful reclamation in a given area. Reclaimed mine land is defined by the WDEQ as affected land that has been backfilled, graded, topsoiled, and permanently seeded in accordance with the approved practices specified in the reclamation plan (Christensen pers. comm.). Species composition on the reclaimed lands may be different than on the surrounding undisturbed lands. The removal of woody species would be considered a long-term impact since these species take approximately 25 years or longer to attain a size comparable to woody species present within proposed disturbance areas. Potential long-term impacts would also include permanent loss of vegetation and vegetative productivity in areas that would not be reclaimed in the near term (e.g., power plant sites).

4.2.8.2 Special-Status Plant Species

Special-status plant species are those species for which state or federal agencies afford an additional level of protection by law, regulation, or policy. Included in this category are federally listed and federally proposed species (species that are protected under the ESA), BLM sensitive species, USDA Forest Service sensitive species, and WGFD species of special concern in Wyoming. No lands administered by the USDA Forest Service are located in the Hay Creek II general analysis area. Species protected under the ESA, as well as BLM sensitive species, are discussed further in appendices J and K of this EIS. Two federally listed plant species (Ute ladies'-tresses orchid and blowout penstemon) and three USDA Forest Service sensitive species (Barr's milkvetch, rosy palafox, and lemonscent) are known to occur or may have potentially suitable habitat in the updated Task 3 study area. Three BLM sensitive species may occur in the Task 3 study area: Nelson's milkvetch, Laramie columbine (Casper Field Office), and William's wafer-parsnip (Buffalo Field Office).

Potential direct impacts on special-status plant species in the study area could include the incremental loss or alteration of potential or known habitat associated with past and projected activities. Direct impacts also could include the direct loss of individual plants within the Task 3 study area, depending on their location in relation to development activities. Indirect impacts could occur because of increased dispersal and establishment of noxious weeds, which may result in the displacement of special-status plant species in the long term.

4.2.8.3 Noxious and Invasive Weed Species

Once established, invasive and nonnative plant species can out-compete and eventually replace native species, thereby reducing forage productivity and the overall vigor and diversity of existing native plant communities. The following 25 plant species are currently designated as noxious weeds by the State of Wyoming:

- field bindweed (*Convolvulus arvensis*),
- Canada thistle (*Cirsium arvense*),
- leafy spurge (*Euphorbia esula*),

- perennial sowthistle (*Sonchus arvensis*),
- quackgrass (*Agropyron repens*),
- hoary cress (*Cardaria draba*),
- perennial pepperweed (giant whitetop) (*Lepidium latifolium*),
- ox-eye daisy (*Chrysanthemum leucanthemum*),
- skeletonleaf bursage (*Franseria discolor Nutt.*),
- Russian knapweed (*Centaurea repens L.*),
- yellow toadflax (*Linaria vulgaris*),
- Dalmatian toadflax (*Linaria dalmatica*),
- Scotch thistle (*Onopordum acanthium*),
- musk thistle (*Carduus nutans*),
- common burdock (*Arctium minus*),
- plumeless thistle (*Carduus acanthoides*),
- dyers woad (*Isatis tinctoria*),
- houndstongue (*Cynoglossum officinale*),
- spotted knapweed (*Centaurea maculosa Lam.*),
- diffuse knapweed (*Centaurea diffusa Lam.*),
- purple loosestrife (*Lythrum salicaria L.*),
- saltcedar (*Tamarix spp.*),
- common St. Johnswort (*Hypericum perforatum*),
- common tansy (*Tanacetum vulgare*), and
- Russian olive (*Elaeagnus angustifolia L.*).

The following three plant species are currently designated as noxious weeds by Campbell County in addition to those listed above.

- buffalobur (*Solanum rostratum Dun.*),
- common cocklebur (*Iva xanthifolia Nutt.*), and
- black henbane (*Hyoscyamus niger L.*).

Development-related construction and operation activities would potentially result in the dispersal of noxious and invasive weed species within and beyond the surface disturbance boundaries, resulting in displacement of native species and changes in species composition in the long term. The potential for these impacts would be higher in relation to the development of linear facilities (e.g., pipeline rights-of-way, oil- and gas-related road systems) than for site facilities (e.g., mines and power plants) due to the potential for dispersal of noxious weeds over a larger area.

Chapter 4, section 2(d)(xiv) of the WDEQ rules and regulations requires that surface coal mines address weed control on reclaimed areas as follows:

> The operator must control and minimize the introduction of noxious weeds in accordance with Federal and State requirements until bond release.

Accordingly, the reclamation plans for all surface coal mines in the Wyoming PRB include steps to control invasion by weedy (invasive nonnative) plant species. As discussed in section 3.9.4, the Buckskin Mine works with the Campbell County Weed and Pest Department and conducts an active noxious weed control program on their existing coal leases. Similar measures to identify and control noxious weeds are used at all of the surface coal mines in the Wyoming PRB as a result of the WDEQ regulatory requirements.

Mitigation to control invasion by noxious weeds for CBNG developers is determined on a site-specific basis and may include spraying herbicides before entering areas and washing vehicles before leaving infested areas. BLM reviews weed educational material during preconstruction on-site meetings with CBNG operators, subcontractors, and landowners. BLM also attaches this educational information to approved applications for permit to drill or plans of development (BLM 2003). BLM also participates in a collaborative effort with the South Goshen Cooperative Extension Conservation District, the Natural Resources Conservation Service, private surface owners, WGFD, and the Campbell County Weed and Pest District in a prevention program that includes a long-term integrated weed management plan, public awareness and prevention programs, and a common inventory (BLM 2003).

4.2.8.4 Wetland and Riparian Species

Operations associated with development activities in the study area would result in the use of groundwater. Annually, during 2010 through 2020, between 30,000 and 42,000 million gallons per year of CBNG-produced water would be discharged to impoundments or intermittent and ephemeral streams or reinjected. The discharge of produced water could result in the creation of wetlands in containment ponds, landscape depressions, and riparian areas along segments of drainages that previously supported upland vegetation. In addition, existing wetlands and riparian areas that would receive additional water would become more extensive and potentially support a greater diversity of wetland species in the long term. Alternately, the discharge of abnormally high flows or water with SAR values of 13 or more could impact existing vegetation as discussed in the 2005 Task 1D Report (BLM 2005e). For agricultural uses, the current Wyoming water quality standard for SAR is 8 (WDEQ 2009). SAR values of 5 to 10 have been observed in discharge waters in the study area (BLM 2003). Once water discharges have peaked and subsequently decrease in the long term, the extent of wetlands and riparian areas and species diversity would decrease accordingly. After the complete cessation of water discharges, artificially created wetland and riparian areas once again would support upland species, and previously existing wetland and riparian areas would decrease in area.

4.2.9 Wildlife and Fisheries

The updated Task 3D Report (BLM 2009g) discusses potential cumulative impacts on wildlife from projected development activities in that study area. The area of habitat disturbance and reclamation for 2003 and 2007and the projected cumulative areas of disturbance and reclamation

for 2010, 2015, and 2020 are shown in tables 4-2 and 4-3. The area of actual habitat disturbance and reclamation for all development in 2003 and 2007 and the projected cumulative total habitat disturbance and reclamation for 2010, 2015, and 2020 are shown in table 4-10.

Impacts on wildlife can be classified as short-term and long-term. Potential short-term impacts arise from habitat disturbance associated with a project's development and operation (e.g., coal mines, CBNG wells) and would cease upon project completion and successful reclamation in a given area. Potential long-term impacts consist of long-term or permanent changes to habitats and the wildlife populations that depend on those habitats, irrespective of reclamation success, and habitat disturbance related to longer term projects (e.g., power plant facilities, rail lines). Direct impacts on wildlife populations from development activities in the study area could include direct mortalities, habitat loss or alteration, habitat fragmentation, or animal displacement. Indirect impacts could include increased noise, additional human presence, and the potential for increased vehicle-related mortalities.

Habitat fragmentation from activities such as roads, well pads, mines, pipelines, and electrical power lines also can result in the direct loss of potential wildlife habitat. Other habitat fragmentation effects such as increased noise, elevated human presence, dispersal of noxious and invasive weed species, and dust deposition from unpaved road traffic can extend beyond the surface disturbance boundaries. These effects result in overall changes in habitat quality, habitat loss, increased animal displacement, reductions in local wildlife populations, and changes in species composition. However, the severity of these effects on terrestrial wildlife would depend on factors such as sensitivity of the species, seasonal use, type and timing of project activities, and physical parameters (e.g., topography, cover, forage, and climate).

4.2.9.1 Game Species

Big game species that are present within the Task 3 study area include pronghorn, white-tailed deer, mule deer, and elk. Potential direct impacts on these species would include the incremental loss or alteration of potential forage and ground cover associated with construction and operation of the past, present, and reasonably foreseeable future development discussed in section 4.1. Development associated with coal mining, drilling for CBNG, ancillary facilities, agricultural operations, urban areas, and transportation and utility corridors result in vegetation removal. Assuming that adjacent habitats would be at or near carrying capacity and considering the variabilities associated with drought conditions and human activities in the study area, the Task 3D Report concluded that displacement of big game as a result of development activities would create some unquantifiable reduction in wildlife populations (BLM 2009g).

A number of big game habitat ranges have been defined within the Task 3 study area. In Wyoming, the WGFD and the BLM have established habitat classifications based on seasonal use. Classification types include crucial winter, severe winter, winter yearlong, and yearlong. Crucial winter range areas are considered essential in determining a game population's ability to maintain itself at a certain level over the long term. As discussed in the updated Task 2 Report (BLM 2009c), discrete locations for most of the disturbance related to the projected development could not be determined based on the available information. However, identified future coal reserves were used for the Task 3D Report (BLM 2009g) to provide some level of quantification of potential future impacts on big game ranges.

Tables 4-22 through 4-25 summarize the effects on pronghorn, deer, and elk game ranges from the predicted lower and upper levels of coal production through 2020.

Table 4-22. Potential Cumulative Disturbance to Pronghorn Ranges from Development Activities—Lower and Upper Coal Production Scenarios

	Pronghorn Ranges[a] (acres/percent affected)			
Time Period/Scenario	Crucial Winter	Severe Winter	Winter Yearlong	Yearlong
2010/Lower N/A		1,472/3%	33,196/2%	32,099/1%
2010/Upper N/A		1,472/3%	34,760/2%	33,172/1%
2015/Lower N/A		1,460/3%	32,649/2%	34,828/1%
2015 Upper	N/A	1,460/3%	34,177/2%	36,999/1%
2020/Lower N/A		1,422/3%	33,637/2%	35,714/1%
2020/Upper N/A		1,422/3%	33,580/2%	37,437/2%

N/A = Not Applicable

[a] Potential coal mine related impacts to big game ranges were determined based on GIS information as follows: the total acres of a big game range (e.g., crucial winter, severe winter, winter yearlong, and yearlong) within the Task 3 study area was divided by the sum of the potential disturbance acreage for the time period (based on GIS mapping of coal reserves for the lower coal production scenario) and 2006 disturbance from coal mine development.

Source: Updated Task 3D Report (BLM 2009g).

Table 4-23. Potential Cumulative Disturbance to White-tailed Deer Ranges from Development Activities—Lower and Upper Coal Production Scenarios

	White-Tailed Deer Ranges[a] (acres/percent affected)			
Time Period/Scenario	Crucial Winter	Severe Winter	Winter Yearlong	Yearlong
2010/Lower N/A		N/A	N/A	1,411/0.6%
2010/Upper N/A		N/A	N/A	1,411/0.6%
2015/Lower N/A		N/A	N/A	1,497/0.7%
2015 Upper	N/A	N/A	N/A	1,495/0.7%
2020/Lower N/A		N/A	N/A	1,704/0.7%
2020/Upper N/A		N/A	N/A	1,707/0.8%

N/A = Not Applicable

[a] Potential coal-mine-related impacts to big game ranges were determined based on GIS information as follows: the total acres of a big game range (e.g., crucial winter, severe winter, winter yearlong, and yearlong) within the Task 3 study area was divided by the sum of the potential disturbance acreage for the time period (based on GIS mapping of coal reserves for the lower coal production scenario) and 2006 disturbance from coal mine development.

Source: Updated Task 3D Report (BLM 2009g).

Table 4-24. Potential Cumulative Disturbance to Mule Deer Ranges from Development Activities—Lower and Upper Coal Production Scenarios

	Mule Deer Ranges[a] (acres/percent affected)			
Time Period/Scenario	Crucial Winter	Severe Winter	Winter Yearlong	Yearlong
2010/Lower N/A		N/A	6,808/0.4%	25,390/1%
2010/Upper N/A		N/A	6,924/0.4%	26,641/1%
2015/Lower N/A		N/A	6,956/0.4%	26,420/1%
2015 Upper	N/A	N/A	7,285/0.5%	27,205/1%
2020/Lower N/A		N/A	6,958/0.4%	27,004/1%
2020/Upper N/A		N/A	7,413/0.5%	27,990/1%

N/A = Not Applicable

[a] Potential coal-mine-related impacts to big game ranges were determined based on GIS information as follows: the total acres of a big game range (e.g., crucial winter, severe winter, winter yearlong, and yearlong) within the Task 3 study area was divided by the sum of the potential disturbance acreage for the time period (based on GIS mapping of coal reserves for the lower coal production scenario) and 2006 disturbance from coal mine development.

Source: Updated Task 3D Report (BLM 2009g).

Table 4-25. Potential Cumulative Disturbance to Elk Ranges from Development Activities—Lower and Upper Coal Production Scenarios

	Elk Ranges[a] (acres/percent affected)			
Time Period/Scenario	Crucial Winter	Severe Winter	Winter Yearlong	Yearlong
2010/Lower 24/0	.4%	N/A	375/1%	1,444/0.9%
2010/Upper 24/0	.4%	N/A	375/1%	1,444/0.9%
2015/Lower 24/0	.4%	N/A	351/1%	1,161/0.7%
2015 Upper	24/0.4%	N/A	351/1%	1,162/0.7%
2020/Lower 24/0	.4%	N/A	351/1%	1,121/0.7%
2020/Upper 24/0	.4%	N/A	351/1%	1,168/0.7%

N/A = Not Applicable

[a] Potential coal-mine-related impacts to big game ranges were determined based on GIS information as follows: the total acres of a big game range (e.g., crucial winter, severe winter, winter yearlong, and yearlong) within the Task 3 study area was divided by the sum of the potential disturbance acreage for the time period (based on GIS mapping of coal reserves for the lower coal production scenario) and 2006 disturbance from coal mine development.

Source: Updated Task 3D Report (BLM 2009g).

Direct and indirect effects to small game species (i.e., upland game birds, waterfowl, small game mammals) within the Task 3 study area as a result of development activities would be the same as discussed above for big game species. Impacts would result from the incremental surface disturbance of potential wildlife habitat, increased noise levels and human presence, dispersal of noxious and invasive weed species, and dust effects from unpaved road traffic.

Operations associated with development activities in the Task 3 study area would result in the use of groundwater. The PRB Coal Review assumes that most, if not all, of the coal-mine-produced water would be consumed during operation and anticipates that up to

approximately 31,000 million gallons per year of water would be produced in association with oil and gas production in 2010, increasing to about 42,000 million gallons per year by 2020. The portion of the water that is produced in association with the CBNG and discharged to impoundments or intermittent and ephemeral streams would be available for area wildlife (e.g., waterfowl). Although much of the water would evaporate or infiltrate into the ground, it is anticipated that substantial quantities of water would remain on the surface and would result in the expansion of wetlands, stockponds, and reservoirs, potentially increasing waterfowl breeding and foraging habitats. The median sodium concentration of CBNG-produced water from the Fort Union Formation is 270 mg/L. If sodium concentrations are maintained below 17,000 mg/L in the evaporation ponds, the potential adverse effects to waterfowl would be minimal.

4.2.9.2 Non-game Species

Potential direct impacts on non-game species (e.g., small mammals, raptors, passerines, amphibians, and reptiles) would include the incremental loss or alteration of existing or potential foraging and breeding habitats from construction and operation of past, present, and reasonably foreseeable future development activities (e.g., vegetation removal for coal mines and CBNG wells, ancillary facilities, and transportation and utility corridors). Impacts also could result in mortalities of less mobile species (e.g., small mammals, reptiles, amphibians, and invertebrates), nest or burrow abandonment, and loss of eggs or young in the path of vehicles and heavy equipment. Indirect impacts would include increased noise levels and human presence, dispersal and invasion of noxious weeds, and dust effects from unpaved road traffic. Assuming that adjacent habitats would be at or near carrying capacity, and considering variable factors such as drought conditions and human activities in the study area, the PRB Coal Review concluded that displacement of wildlife species from the Task 3 study area would result in an unquantifiable reduction in wildlife populations.

Numerous migratory bird species have been documented within the PRB over the last two to three decades of wildlife monitoring. Development activities that occur during the migratory bird breeding season (April 1 through July 31) could cause the abandonment of a nest site or territory or the loss of eggs or young, resulting in the loss of productivity for the breeding season. Loss of an active nest site, incubating adults, eggs, or young would not comply with the intent of the Migratory Bird Treaty Act and could potentially affect populations of important migratory bird species that may occur in the PRB.

Breeding raptor species that occur in the PRB Coal Review study area include the bald eagle, golden eagle, ferruginous hawk, red-tailed hawk, rough-legged hawk, Swainson's hawk, American kestrel, prairie falcon, northern harrier, great horned owl, short-eared owl, burrowing owl, long-eared owl (*Asio otus*). Bald eagles and long-eared owls (*Asio otus*) are rare nesters in the area.

One potential direct impact on raptors is habitat (nesting and foraging) loss because of additional surface disturbance in the Task 3 study area. In the event that development activities were to occur during the breeding season (February 1 through July 31), these activities could result in nest or territory abandonment, or loss of eggs or young. Such losses would reduce productivity for the affected species during that breeding season. As discussed above, loss of an active nest site, incubating adults, eggs, or young would not comply with the intent of several laws, including the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. Efforts

to minimize impacts on nesting raptors are addressed in each mine's USFWS-approved avian monitoring and mitigation plan.

Additional direct impacts could result from construction of new overhead power lines in the region. New power line segments in the study area would incrementally increase the collision and/or electrocution potential for migrating and foraging bird species (e.g., raptors and waterfowl) (Avian Power Line Interaction Committee 2006). However, the potential for avian collisions with overhead power lines is typically dependent on variables such as the location of the structures relative to high-use areas (e.g., nesting, foraging, staging, and roosting habitats), the orientation of the power lines to flight patterns and movement corridors, species composition, line visibility, and structure design. Few collisions have been reported in the Task 3 study area because of the limited presence of perennial water bodies and other features that would attract large numbers of migrating waterfowl or other vulnerable species.

In addition, new power lines could pose an electrocution hazard for raptor species attempting to perch on the structure. Configurations greater than 69 kV typically do not present an electrocution potential, based on conductor placement and orientation (Avian Power Line Interaction Committee 2006). It is assumed that future permitting for power lines would require the use of appropriate raptor-deterring designs, thereby minimizing potential impacts. For example, SMCRA requires that surface coal mine operators use the best technology available to ensure that electric power lines are designed and constructed to minimize electrocution hazards to raptors. Power line impacts on raptors can be reduced with the increased use of underground power lines wherever possible. Many of the power lines for CBNG development currently are being constructed underground.

4.2.9.3 Fisheries

Potential cumulative effects on fisheries from of development activities in the Task 3 study area would be closely related to impacts on ground and surface water resources. In general, development activities could affect fish species in the following ways: 1) alteration or loss of habitat as a result of surface disturbance; 2) changes in water quality as a result of surface disturbance or introduction of contaminants into drainages; and 3) changes in available habitat as a result of water withdrawals or discharge. The potential effects of development activities on aquatic communities are discussed below for each of these impact topics.

The predominant aquatic habitat type in the Task 3 study area consists of intermittent and ephemeral streams and scattered ponds and reservoirs. In general, perennial streams within the study area are limited to the Little Powder River and Belle Fourche River. Warm water game fish and non-game species are present in some perennial stream segments and numerous scattered reservoirs and ponds. However, the latter features are typically stocked artificially either following construction or annually, depending on the depth of the water body. Due to the lack of constant water in most of the potentially affected streams and static water bodies, existing aquatic communities are mainly limited to invertebrates and algae that can persist in these types of habitats. The removal of stockponds would eliminate habitat for invertebrates and possibly fish species. This loss would be temporary if the stockponds are replaced during reclamation.

Development activities could result in the loss of aquatic habitat as a result of direct surface disturbance. Table 4-10 summarizes the actual cumulative acres of surface disturbance and

reclamation as of 2003 and 2007 and the projected cumulative acres of surface disturbance and reclamation for 2010, 2015, and 2020. Discrete locations for development disturbance and reclamation areas eannot be determined based on existing information. However, projected development that could result in the loss of aquatic habitat would involve construction of additional linear facilities, product gathering lines and road systems associated with conventional oil and gas and CBNG activities, as well as any additional disturbance associated with extending coal mine operations onto lands adjacent to the existing mines. The removal of aquatic habitat eliminates existing and potential habitat for invertebrates and some fish species. This loss would be temporary if such ponds are reconstructed and recharged as part of the reclamation process.

Projected activities would result in surface disturbance in each of the six study area subwatersheds. Information relative to the stream crossing locations for the majority of the linear facilities is not available at this time. The initial phases of the proposed Bison Pipeline project commenced in April 2008 and were projected to be completed by mid-December 2010. If the project is constructed as planned, it would cross Cottonwood Creek, a tributary of the Little Powder River. Typically, the associated disturbance corridor would consist of a 100-foot-wide construction right-of-way; however, site-specific stream crossing methods and reclamation would be determined at the time of project permitting.

Future coal mining also could remove intermittent or ephemeral streams and stockponds in the Antelope Creek, Upper Cheyenne River, Upper Belle Fourche River, and Little Powder River subwatersheds. Coal mine permits provide for removal of first- through fourth-order drainages. During reclamation, third- and fourth-order drainages must be restored; first- and second-order drainages often are not replaced (Martin et al. 1988). As discussed in section 3.5.2, the Little Powder River and its tributaries drain the existing Buckskin Mine permit area and the Hay Creek II general analysis area. All streams in and adjacent to the general analysis area are typical for the region, in that flow events are ephemeral. Under natural conditions, aquatic habitat is limited by that ephemeral nature and seasonal occurrence of surface waters in the general analysis area. No uncommon fish species have been documented in baseline aquatics monitoring conducted for Buekskin and other mines in the PRB since the mid-1970s. Given the limited nature and extent of drainages and water bodies, none would be expected to occur in the Hay Creek II general analysis area or at other mines in the north group. Surveys for fish species of concern will be conducted as needed in appropriate habitat prior to disturbance.

The PRB Coal Review assumes that surface-disturbing activities would not be allowed in perennial stream segments or reservoirs on public lands that contain game fish species. It also assumes that other types of development operations would not occur within stream channels nor would they remove ponds or reservoirs as part of construction or operation and, therefore, would not result in the direet loss of habitat for these species.

Water quality parameters sueh as turbidity and bottom substrate composition can be affected by surface disturbing activities through erosion of sediment into water bodies. Contaminants can also be introduced into those systems through the chemieal characteristics of the eroded sediment. Potential related effects on aquatic biota could include physiological stress, movement to avoid affected areas, or alterations of spawning or rearing areas (Waters 1995). Studies have shown that TDS levels in streams near reclaimed coal lands have increased from 1% to 7% (Martin et al. 1988). Typically, sedimentation effects are short-term and localized in terms of the affected area. TDS concentrations would stabilize and return to more typical concentrations after

construction or development activities have been completed. The PRB Coal Review anticipated that the use of appropriate erosion and spill control measures during both development and reclamation activities, as determined during the permitting process, would minimize the introduction of additional sediments into the subwatershed.

The removal of streamside vegetation would impact both riparian vegetation and stream parameters in those locations. Loss of vegetation along stream channels would reduce the shade and increase bank erosion, both of which would degrade aquatic habitats. Effects on aquatic habitats from linear projects, such as rights-of-way, would be limited to a relatively small portion of the stream (generally no more than 100 feet in width), whereas mine-related disturbance could affect considerably larger stretches. Because perennial streams are protected from development by a buffer zone on either side of center, these types of impacts would presumably be limited to intermittent and ephemeral creeks. It is anticipated that reclamation practices to restore riparian vegetation would be required during future project permitting, thereby minimizing such impacts.

CBNG and coal mining are the primary types of energy development activities in the PRB that use or manage water as part of their operations. Based on current trends, the PRB Coal Review assumes that most, if not all, of the water produced during coal mining would be consumed during operation.

As discussed in section 3.5.2.2, changes in surface runoff characteristics and sediment discharges would occur during surface coal mining from the destruction and reconstruction of drainage channels as mining progresses, and the use of sediment control structures to manage discharges of surface water from the mine permit area. State and federal regulations require treatment of surface runoff from mined lands to meet effluent standards. After treatment, coal-mine-related surface water in the region would ultimately be discharged into intermittent and ephemeral streams in four subwatersheds (Antelope Creek, Upper Cheyenne River, Upper Belle Fourche River, and Little Powder River).

The PRB Coal Review assumes that most, if not all, of the coal-mine-produced water would be consumed during operation. The review anticipates that approximately 31,000 million gallons per year of water would be produced in association with oil and gas production in 2010, increasing to approximately 42,000 million gallons per year in 2020; it also assumes that a portion of the water that is produced in association with the CBNG would be discharged to intermittent and ephemeral drainages in the Hay Creek II general analysis area, much as is currently allowed in the six subwatersheds in the study area. Based on past monitoring in receiving streams, no change in surface flows would be expected beyond approximately 2 miles from the discharge points (BLM 2003). Water discharged from CBNG wells has supplied some drainages and water bodies in the PRB nearly continuously for several years. Within the general analysis area, Spring Creek has experienced an influx of CBNG water in recent years but has not become perennial. The same is true for other streams elsewhere in the PRB that receive CBNG discharge water.

4.2.9.4 Special-Status Species

Special-status species are those species for which state or federal agencies afford an additional level of protection by law, regulation, or policy. Included in this category are federally listed and federally proposed species (species that are protected under the ESA), BLM sensitive species,

USDA Forest Service sensitive species, and WGFD species of special concern in Wyoming. No USDA Forest Service administered lands are present in the Hay Creek II general analysis area. Species that are protected under the ESA, as well as BLM sensitive species, are further discussed in appendices J and K. The USFWS also has a list of migratory bird species of management concern for surface coal mines in Wyoming, which is discussed in section 3.10. Special-status species potentially occurring in the 2005 Task 1 study area are identified in section 2.4.3.5 of that Task 1D Report (BLM 2005e). Additional information about the occurrence of these species in the general analysis area is contained in the annual wildlife reports for the Buckskin Mine, on file with the Sheridan, Wyoming office of the WDEQ.

Potential impacts on special-status terrestrial species would be similar to those discussed above for non-game wildlife (e.g., small mammals, birds, amphibians, and reptiles). Potential direct impacts would include the incremental loss or alteration of potential habitat (native vegetation and previously disturbed vegetation) from construction and operation of development activities (e.g., vegetation removal for coal mines and CBNG wells, ancillary facilities, and transportation and utility corridors). Impacts could also result in mortalities of less mobile species (e.g., small mammals, reptiles, and amphibians), nest or burrow abandonment, and loss of eggs or young in the path of vehicles and heavy equipment. Indirect impacts would include increased noise levels and human presence, introduction and dispersal of noxious weeds, and dust effects from unpaved road traffic.

In general, direct and indirect impacts on special-status species would result in a reduction in habitat suitability and overall carrying capacity for species currently inhabiting the Task 3 study area. Development within potential habitat for special-status species likely would decrease its overall suitability, and potentially would reduce or preclude use by some species because of increased activity and noise. Future use by a special-status species of habitats subject to development would be strongly influenced by the quality and composition of remaining habitat, with the degree of impact dependent on variables such as breeding phenology, nest and den site preferences, the species' relative sensitivity to disturbance, and possibly the presence of visual barriers (e.g., topographic shielding) between nesting efforts and disturbance activities.

Bird species that have been identified as occurring within the PRB and are on two or more of the special-status species lists include the common loon (*Gavia immer*), American bittern (*Botaurus lentiginosus*), white faced ibis (*Plegadis chihi*), trumpeter swan (*Cygnus buccinator*), greater sandhill crane (*Grus canadensis*), mountain plover, upland sandpiper, long-billed curlew, black tern (*Chlidonias niger*), yellow-billed cuckoo (*Coccyzus americanus*), Lewis' woodpecker (*Melanerpes lewis*), pygmy nuthatch (*Sitta pygmaea*), sage thrasher (*Oreoscoptes montanus*), loggerhead shrike, Baird's sparrow (*Ammodramus bairdii*), sage sparrow (*Amphispiza belli*), Brewer's sparrow, and greater sage-grouse. Only the Brewer's sparrow, sage-grouse, upland sandpiper, long-billed curlew, loggerhead shrike, and sage thrasher (one sighting) have been documented at the Buckskin Mine during 25 years of annual monitoring. Only the Brewer's sparrow is seen with any regularity, and those observations typically occur in a sagebrush stand approximately 1.5 miles south of the Hay Creek II general analysis area. Any development activities (oil and gas, coal mining, other operations and associated infrastructure) that occur during the breeding season (April 1 through July 31) could result in the abandonment of a nest site or territory, or the loss of eggs or young. As discussed previously, loss of an active nest site, incubating adults, eggs, or young from any of these development activities would not comply

with the intent of the Migratory Bird Treaty Act and could potentially impact populations of important migratory bird species that are known to or may occur in the PRB.

A number of raptor species have been documented in the PRB and are on two or more of the special-status species lists, including the bald eagle, ferruginous hawk, northern goshawk, merlin, peregrine falcon, western burrowing owl, and short-eared owl. Species that have been documented in the general analysis area are discussed at length in section 3.10.5, with additional information in appendix K. Potential direct impacts on raptors would result from the surface disturbance of nesting and foraging habitat, as well as injury or mortalities because of collisions with vehicles and equipment. Nesting raptors in or adjacent to development activities could abandon their nest sites or territories, or lose eggs or young. As previously described, such losses would constitute non-compliance with the intent of multiple laws, including the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The implementation of USFWS-approved avian monitoring and mitigation measures at surface coal mines in the Task 3 study area has minimized impacts on nesting raptors over the last 30 years. Any impacts that could occur would likely be limited to individual pairs and, thus, are not likely to affect populations of raptors or other migratory bird species that are known to or can occur in the region. Incremental construction of new overhead power lines in the area to support energy industries would increase risks of electrocution and collision for perching, migrating, and foraging bird species such as the larger raptors. Use of current Avian Power Line Interaction Committee guidelines for new construction designs and retrofitting measures for new and existing utility structures would help mitigate these impacts.

At least 477 greater sage-grouse strutting grounds (leks) were identified in the six subwatersheds in the PRB Coal Review study area through 2008, though not all leks are counted every year (WGFD 2008b). As discussed in section 3.10 and in the Task 1D Report (BLM 2005e), the trend in the sage-grouse population for the Sheridan region suggests about a 10-year cycle with periodic highs and lows. More recent population peaks have been lower than previous highs, suggesting a steadily declining sage-grouse population with the Sheridan region (Oedekoven 2001; WGFD 2008b). Direct and indirect impacts on sage-grouse from development activities would result from the incremental surface disturbance of existing and potential habitat, increased levels of noise and human presence, introduction or dispersal of noxious and invasive weed species, and effects of dust from increased traffic on unpaved roads. In addition to disturbance-related impacts, sage-grouse are susceptible to infection with West Nile virus, and the incidence of infection from this disease has been much higher in northeast Wyoming than the rest of the state in the past, though fewer cases have been reported in recent years.

Based on results from annual counts and lek searches conducted for the Buckskin Mine since 1984, sage-grouse occur but are not abundant in the general analysis area (section 3.10.6). Three sage-grouse leks have been identified in the general analysis area. One of those three sites is classified by the WGFD as unoccupied (historical/abandoned) due to its consistent lack of use over the last 16 consecutive years. The remaining two leks have also been inactive in recent years, but are still classified as occupied by the WGFD. The Hay Creek sage-grouse lek is within the existing Buckskin Mine permit area, approximately 0.5 mile southeast of the general analysis area. This site has been or will be affected by previously permitted disturbance in the permit area. The McGee sage-grouse lek is approximately 1.25 miles north of the general analysis area, on the far side of multiple ridgelines. Two displaying males and three hens were

seen at the Hay Creek lek on one morning in 2001, but no grouse were present during subsequent checks that year, or in any year since then. The McGee sage-grouse lek is located beyond the required annual monitoring area for the Buckskin Mine and, therefore, is not included in that monitoring program. A WGFD biologist first recorded the lek in 2001. Three displaying males were observed at the McGee sage-grouse lek in 2004. No grouse have been recorded at that lek since then, but it was not monitored every year.

If the proposed tract or an alternative tract configuration is leased and mined, potential nesting habitat for grouse that were bred at those leks would be affected by mining activity in those areas. However, as discussed in section 3.10.6.1, no sage-grouse nests or broods have been encountered in the general analysis area during specific surveys or incidental to other wildlife surveys conducted there annually since at least 1984. The noise associated with mining operations may also disrupt sage-grouse breeding and nesting activities that might occur in the area. Direct and indirect effects on greater sage-grouse within the general analysis area from development activities are outlined in section 3.10.6.2.

Based on existing information, the spatial relationship between projected future disturbance and reclamation areas for the coal production scenarios and the resource-specific information in the GIS layers could not be determined for the PRB Coal Review. However, the analysis did use GIS layers for future coal reserves to provide some quantification of potential future coal-mining-related impacts on greater sage-grouse. The results of this analysis are summarized in table 4-26. The difference in the number of lek sites that would occur within 2 miles of coal mining activities under the lower coal production scenario versus the upper coal production scenario is because of slight variations in the projected disturbance areas. An unquantifiable number of lek sites initially could be affected by CBNG activity, which would occur in advance of coal mine development. Potential direct impacts on sage-grouse, if present, could include loss of foraging areas, abandonment of a lek site, or loss of eggs or young as a result of development activities.

Table 4-26. Potential Cumulative Impacts on Greater Sage-grouse Leks from Coal Mine Development—Upper and Lower Coal Production Scenarios

Lek Categories	2010/Lower	2010/Upper	2015/Lower	2015/Upper	2020/Lower	2020/Upper
Number of Directly Affected Leks	3	3	4	4	1	4
Number of Leks within 2 Miles of Coal Mining Activity	30	30	31	35	28	27

Source: Updated Task 3D Report (BLM 2009g).

Seven special-status fish species potentially occur in the Task 3 study area subwatersheds: the flathead chub (*Platygobio gracilis*) (Antelope Creek, Upper Cheyenne River, and Little Powder River subwatersheds), plains topminnow (*Fundulus sciadicus*) (Upper Cheyenne River), goldeye (*Hiodon alosoides*) (Little Powder River), lake chub (*Couesius plumbeus*) (Little Powder River), mountain sucker (*Catostomus platyrhynchus*) (Little Powder River), silvery minnow (*Hybognathus argyritis*) (Little Powder River), and plains minnow (Upper Cheyenne River, Upper Belle Fourche River, and Little Powder River). Potential impacts on special-status fish species from development activities would be similar to effects discussed above for fisheries. Surface disturbance in three subwatersheds (Upper Cheyenne River, Upper Belle Fourche River,

Little Powder River) could alter habitat or affect water quality conditions for special-status fish species. Erosion control measures, as required by existing and future permits, and NPDES permit requirements would be implemented for each project. These efforts would help decrease disturbance-related sediment input into stream segments that may contain one or more of the special-status fish species. Therefore, it is anticipated that impacts on special-status fish species would be low.

4.2.10 Land Use and Recreation

The updated Task 3D Report (BLM 2009g) discusses potential cumulative impacts on land use and recreation as a result of projected development activities in that study area (map 4-2). The area of actual surface coal mining disturbance and reclamation for 2003 and 2007 and the projected cumulative areas of disturbance and reclamation for 2010, 2015, and 2020 are shown in tables 4-2 and 4-3. Table 4-10 shows the area of actual disturbance and reclamation for all development in 2003 and 2007 and the projected cumulative total areas of disturbance and reclamation for 2010, 2015, and 2020.

The PRB is a predominantly rural, wide open landscape. With little rainfall and limited alternative sources of water, the primary land use is grazing. Nevertheless, there is a range of other land uses. The major categories include agriculture, forested, mixed rangeland, urban, water, wetlands, coal mines, and barren land. The relative amounts of these lands in the Task 1 and Task 2 study area (map 4-1) is tabulated in table 4-27.

Table 4-27. PRB Land Use by Surface Ownership

	Surface Ownership (acres)				Total	
Use Category	BLM	USDA Forest Service	State	Private	Acres	Percent
Agriculture 2,62	7	14,197	13,770	472,811	503,405	6.3
Barren 165		205	187	9,396	9,953	0.1
Forested 137,	555	14,604	48,645	332,062	532,866	6.7
Mixed Rangeland	732,014	218,156	561,363	5,271,644	6,783,177	86.0
Urban 893		17	1,039	25,469	27,418	0.3
Water 35		73	334	4,773	5,215	<0.1
Wetlands 0		104	559	1,566	2,229	<0.1
Coal Mines	149	7,236	2,805	40,917	51,107	0.6
Total 873,	438	254,592	628,702	6,158,638	7,915,370	100.0

Source: Task 1D Report (BLM 2005e).

A large part of the PRB consists of split-estate lands (privately owned surface lands underlain by federally owned minerals). This results in conflicts between surface users, which are mainly ranching interests and mineral developers. Conflicts with some dispersed rural residences may also occur, although specific locations cannot be identified until development is proposed.

Much of the Task 3 study area is also used for dispersed recreational activities such as hunting. The study area includes surface lands that are federally, state, and privately owned; all surface lands in the general analysis area are under private ownership. With nearly 80% of the overall study area privately owned, public lands provide important open space and recreation resources including both developed recreation facilities and areas to pursue dispersed recreation activities. The private sector contributes the elements of commercial recreation opportunities and tourism services such as motels and restaurants. Some private land owners also allow hunting with specific permission, sometimes for a fee.

4.2.10.1 Grazing and Agriculture

Potential impacts on grazing in the Task 3 study area as a result of development activities can be classified as short-term and long-term. Potential short-term impacts arise from:

- the temporary loss of forage as a result of vegetation removal/disturbance;
- temporary loss of animal unit months (amount of forage a cow/calf unit or a single bull can eat in a month, used to determine stocking rates for livestock);
- temporary loss of water-related range improvements, such as improved springs, water pipelines, and stockponds;
- temporary loss of other range improvements, such as fences and cattle guards; and
- restricted movement of livestock within an allotment due to the development and operation of projects like surface coal mines, which would cease after successful reclamation had been achieved and replacement of water-related and other range improvements had been completed.

The discharge of produced water could increase the availability of water to livestock, which may offset the temporary loss of water-related range improvements. Potential long-term impacts consist of permanent loss of forage and forage productivity in areas, such as large structures, that would not be reclaimed in the near term. Indirect impacts may include dispersal of noxious and invasive weed species within and beyond the surface disturbance boundaries, which decreases the amount of desirable forage available for livestock grazing in the long term.

Development activities could result in short- and long-term impacts on agricultural land, depending on their spatial relationship. Short-term impacts would include the loss of crop production during development and operational phases of the projects. Long-term impacts would result from the permanent loss of agricultural land due the development of permanent facilities such as power plants and railroads.

Table 4-28 contains an estimate of the number of animal unit months unavailable on lands disturbed and not yet reclaimed through 2020 for the high and low levels of predicted development activity, along with the acreage of cropland estimated to be affected.

Table 4-28. Animal Unit Months and Acres of Cropland Estimated Unavailable on Lands Disturbed and Not Yet Reclaimed as a Result of Development Activities

Category	2003/ Baseline	2007/ Actual	2010/ Lower	2010/ Upper	2015/ Lower	2015/ Upper	2020/ Lower	2020/ Upper
Unavailable Animal unit months[a]	18,150	22,108	19,820	20,145 2	2,389 2	2,905 2	2,131 2	2,950
Unavailable Crop Land (acres)	48 —	[b]	59	60 134	139	206	289	

[a] Based on an average stocking rate of 6 acres per animal unit month.

[b] Not reported.

Source: Updated Task 3D Report (BLM 2009g).

4.2.10.2 Urban Use

It is expected that there would be additional expansion of urban residential and commercial development as a result of the projected 48% growth in population (between 2003 and 2020) in Campbell County. Section 4.2.13 and the 2005 Task 3C Report (BLM 2005a) contain additional information on employment and population issues in the study area. A majority of the new urban development would be expected to occur adjacent to existing communities, primarily Gillette, which accounts for approximately 60% of the Campbell County population and, to a lesser extent, Wright and other small communities. Most of this development would occur on land that is currently used for grazing or agriculture.

4.2.10.3 Recreation

Accessible public lands provide diverse opportunities for recreation, including hunting, fishing, off-road vehicle use, sightseeing, and wildlife observation. The National System of Public Lands generally provides dispersed recreational uses in the study area. Some developed recreational facilities occur in special management areas, including recreation areas. While opportunities are available on public lands throughout the PRB, the majority of dispersed recreational uses occur in the western part of the PRB Coal Review study areas, including the South Big Horn Mountains area and along the Powder River. Public lands elsewhere consist mainly of isolated tracts of land that are too small to provide a quality recreational experience. Larger parcels of public lands occur in the southwest part of Johnson County and along the Powder River (administered by BLM) and in the Thunder Basin National Grassland (administered by the USDA Forest Service). Public lands are accessible via public roads or across private land with the landowner's permission.

Hunting is a major recreation use of state and federal lands in the study area. Various big game and upland game bird species are hunted in the region. Fishing is a popular year-round activity for residents of the study area.

Mule deer and pronghorn hunting are by far the most popular hunting activities in the Task 1 study area, accounting for 35,529 and 21,304 hunter days, respectively, in 2003 (Stratham pers. comm.). The next highest were cottontail rabbit (2,348 hunter days) and elk (2,055 hunter days), followed by wild turkey (1,019), sharp-tailed grouse (508), and sage-grouse (38). Consistent trends in hunter activity over the past decade are not discernible from the WGFD data considered

in the PRB Coal Review. All of the most prominent species hunted in the study area have had high years and low years. Pronghorn hunting, for example, was greatest from 1993 to 1996, while elk hunting was at its peak in 2001 and 2002. Mule deer hunting has been the most consistent, ranging from a low of 28,311 hunter days in 1996 to a high of 37,307 hunter days in 2002.

Off-road vehicle use in the study area is available on most BLM-managed lands. Much of the public land in Johnson, Sheridan, and Campbell counties has been inventoried and designated as open, limited, or closed to off-road vehicle use. For the baseline year, approximately 20,386 acres were open to unlimited vehicle travel on and off roads. There were 4,680 acres in the area that were closed to all off-road vehicle use and approximately 867,534 acres were available for limited use. Limited use typically means off-road vehicles are restricted to existing roads and vehicle routes.

Recreational use of public lands in the study area has increased substantially over the past two decades, and is expected to continue to increase by about 5% every five years for most recreational activities (BLM 2003). Total visitor use by residents and nonresident visitors in Campbell and Converse counties in 1980 was projected at 1,276,000 visitor days (BLM 1979). The total visitor days of 1,881,763 estimated for 1990 was approximately 47% higher than the 1980 visitor days (BLM 2001). Fewer than 3% of visitor days were estimated to occur on public lands.

Few, if any, of the developed recreation sites in the Task 3 study area would be affected by development-related disturbance. As most of the projected disturbance area would occur on privately owned surface land, the extent of effects on dispersed recreation activities largely would depend on whether the disturbance areas had been open to public or private hunting. It is projected that cumulative development activities, especially the dispersed development of CBNG and, to a lesser extent, conventional oil and gas, would tend to exacerbate the trend toward a reduction in private land available for public hunting, which has been observed by WGFD in recent years (Shorma pers. comm.). A reduction in available private land for dispersed recreation would contrast with the anticipated increase in demand for recreational opportunities and would tend to push more recreationists toward public lands where the BLM has projected a 5% increase in use every five years (BLM 2001). After coal-related and oil- and gas-related development activities have been completed and the disturbed areas have been reclaimed, many of the adverse effects on dispersed recreation activities would be reduced.

It is expected that the development activities also would tend to expand and exacerbate the qualitative degradation of the dispersed recreation experience, in general, and of the hunting experience, in particular, as reported by the WGFD (Jahnke pers. comm.). As noted in the 2005 Task 1D Report (BLM 2005e), reductions in land available for hunting also make herd management more difficult for the WGFD and reduce its hunting-derived revenues (Shorma pers. comm.).

No direct effects on wilderness or roadless areas would be expected from the projected development activities. There are no designated wilderness areas in the study area, and mineral development would not be permitted in the Fortification Creek Wilderness Study Area until and unless Congress acts to remove it from wilderness consideration. Mineral development could be permitted within the Fortification Creek Planning area and the stricter Fortification Creek area of critical environmental Concern, as long as all applicable qualifications and requirements are met or exceeded.

No Wild and Scenic Rivers would be affected, because the only river segment identified as both "eligible" and "suitable" in the Task 1D Report is outside of the Task 3 study area (BLM 2005e).

4.2.11 Cultural Resources and Native American Concerns

The updated Task 3D Report (BLM 2009g) discusses potential cumulative impacts on cultural resources from projected development activities in that study area. The area of actual surface coal mining disturbance and reclamation for 2003 and 2007 and the projected cumulative areas of disturbance and reclamation for 2010, 2015, and 2020 are shown in tables 4-2 and 4-3. Table 4-10 shows the area of actual disturbance and reclamation for all development in 2003 and 2007 and the projected cumulative total areas of disturbance and reclamation for 2010, 2015, and 2020.

Cultural sites occur throughout the study area. Surface-disturbing activities can result in the loss or destruction of these sites. Table 4-29 contains an estimate of the amount of projected disturbance through 2020 for the projected lower and upper levels of coal development activity, along with the number of cultural sites estimated to be affected. The sites fall into two categories: prehistoric sites and historic sites, as described below. Also below are descriptions of Native American traditional cultural places and a summary of the program to protect sites in any of these categories.

4.2.11.1 Prehistoric Sites

All recognized prehistoric cultural periods, from Clovis through Protohistoric (about 11,500 to 200 years ago), are represented in the PRB Coal Review study area (see section 3.12 for additional discussion about the prehistoric cultural periods.) Only a small number of sites represent the earliest prehistoric cultural periods—Paleoindian through Early Plains Archaic. Archaic and later prehistoric period sites (Archaic to Protohistoric) are represented in increasing numbers as result of higher populations through time and better preservation of more recent sites. Important prehistoric site types in the region include artifact scatters, campsites, stone circles, faunal kill and processing sites, rock alignments and cairns, and stone material procurement areas. Lithic scatters (scatters consisting primarily of stone tools and debris from manufacture or maintenance of stone tools) are the primary prehistoric sites in the study area. Lithic scatters expressed on the surface are typically not eligible for inclusion on the NRHP. Sites with buried dateable material such as charcoal or bone can yield important information and are often field evaluated as eligible

Table 4-29. Square Miles of Projected Cumulative Disturbance and Number of Potentially Affected Cultural Resource Sites in the Task 3 Study Area—Lower and Upper Coal Production Scenarios

Subwatershed	Average Number of Sites per Square Mile[a]	Lower Coal Production Scenario						Upper Coal Production Scenario					
		Year 2010		Year 2015		Year 2020		Year 2010		Year 2015		Year 2020	
		Square Miles[b]	Sites[c]	Square Miles[b]	Sites[c]	Square Miles[b]	Sites[c]	Square Miles[b]	Sites[c]	Square Miles[b]	Sites[c]	Square Miles[b]	Sites[c]
Antelope Creek	4.7	59	277	76	357	94 442		61	287	79	371	98 461	
Dry Fork Cheyenne River	8.9	2.2	20	2.7	24	3.1	28	2.2	20	2.7	24	3.1	28
Little Powder River	4.6	76	350	85	391	89	409	77	354	86	396	91	419
Upper Belle Fourche River	4.3	135	580	148	636	156	671	137	589	154	662	166	714
Upper Cheyenne River	5.2	57	296	66	343	76 395		58	302	68	354	78 406	
Upper Powder River	5.0	160	530	175	875	242	1,210	106	530	175	875	242	1,210
Total		435	2,053	553	2,626	660 3,15	5	441	2,082	565	2,682	678 3,28	3

[a] Average number of sites per square mile based on previous surveys in the study area.

[b] Calculated, based on database disturbance acreages prepared for the updated Task 2 Report, Past and Present and Reasonably Foreseeable Development Activities (Appendices A and D) (BLM 2009c).

[c] The number of sites was calculated by multiplying the average density of known cultural sites per square mile (based on previous surveys) by the number of square miles of projected cumulative disturbance.

Source: Updated Task 3D Report (BLM 2009g).

Five prehistoric sites are documented in the Hay Creek II general analysis area. Site 48CA857 was originally recorded in 1980 and contained a lithic scatter and a stone circle. The site was not relocated during a 1999 inventory and is listed as "destroyed" in the SHPO database. Sites 48CA 861, 48CA862 and 48CA1828 are lithic scatters containing very few artifacts originally recorded in the 1980s. None of these sites were relocated during later inventories and are determined not eligible for the NRHP. Site 48CA 2223 was originally recorded in 1985 as a lithic scatter containing a Late Prehistoric projectile point and a prehistoric pottery shard. The site is in a plowed field and was determined not eligible since buried deposits were not expected. A later inventory discovered historic trash at the location, but did not relocate any prehistoric artifacts. The Proposed Action and alternatives would destroy the above sites, although none of the sites are intact and they are all determined not eligible for the NRHP. On February 12, 2009, the BLM notified SHPO that the undertaking would result in no effect on historic properties.

4.2.11.2 Historic Sites

In the PRB region, sites are documented within the broad contexts of rural settlement, urban settlement, mining, transportation, military, exploration, and communication. Each of these site categories and the types of sites they include are detailed in the 2005 Task 1D Report (BLM 2005e). Eight historic sites documented in the Hay Creek II general analysis area fall under the context of rural settlement. Evaluation of the importance of historic sites, districts, and landscapes must consider aspects of both theme and period in assessing the historic character and contributing attributes of the resources.

4.2.11.3 Native American Traditional Cultural Places

General ethnographies of the tribes that may have had traditional ties to this region do not provide information on specific resources in the study area that are likely to be traditional cultural concerns because these resources are considered confidential by the tribes. Within this region, there are prominent and identifiable places such as the Medicine Wheel to the west in the Big Horn Mountains and Devils Tower to the east in the Black Hills area. These known sites offer some indication of the types of places valued by the Plains horse cultures in the historic period. Any identification of sacred or traditional localities must be verified in consultation with authorized tribal representatives.

4.2.11.4 Site Protection

At the time an individual project is permitted, the development activities considered in this study would be subject to the following regulations relative to cultural resources. Section 106 of the National Historic Preservation Act of 1966 as amended, its implementing regulations (including but not limited to 36 CFR 800, 36 CFR 61, and Executive Order 11593), and NEPA and its implementing regulations, including 40 CFR 1500–1508, provide the legal environment for documentation, evaluation, and protection of historic properties (i.e., cultural resources eligible for inclusion on the NRHP) that may be affected by development activities. In cases of split estate where the surface ownership is private and mineral ownership was retained by the US Government, surface resources such as cultural or archeological sites are the property of the surface owner. Federal agencies must ensure that undertakings associated with federal minerals development adhere to applicable cultural resource laws and regulation, although, the surface owner must be consulted about any archeological investigation, mitigation, or monitoring.

4.2.12 Transportation and Utilities

The updated Task 3D Report (BLM 2009g) discusses potential cumulative impacts on transportation and utilities systems as a result of projected development activities in that study area. The area of actual surface coal mining disturbance and reclamation for 2003 and 2007 and the projected cumulative areas of disturbance and reclamation for 2010, 2015, and 2020 are shown in tables 4-2 and 4-3. The area of actual disturbance and reclamation for all development in 2003 and 2007and the projected cumulative total areas of disturbance and reclamation for 2010, 2015, and 2020 are shown in table 4-10.

Generally, transportation systems in the study area would not be directly affected by the disturbance associated with projected development. Site-specific instances of disturbance may require that segments of highways, pipelines, transmission lines, or railroads be moved to accommodate expansion of certain coal mines. In such cases, the agencies authorized to regulate such actions would have to approve any proposal to move any segments of any transportation systems. Construction of alternative routing would be required prior to closing existing links so that any disruptive effects on transportation systems would be minimized.

The coal mines in the North Gillette subregion currently ship most of their coal via the east-west BNSF rail line through Gillette. That subregion produced 55 million tons per year in the baseline year (2003), which was just 22% of the estimated 250 million tons per year capacity of the BNSF rail line (BLM 2005b). The coal mines in the South Gillette and Wright subregions produced approximately 308 million tons per year in 2003, which was 88% of the estimated 350 million tons per year capacity of the joint BNSF and UP line serving those areas in the baseline year.

Potential effects of development activities on transportation and utilities may be either short- or long-term, varying with the type of development. A power plant or an urban community development would be considered long-term, and the demand for transmission line capacity would be virtually permanent, lasting for the economic life of the activity. The effects of coal production and the related demand for rail capacity would vary with market changes. In recent years, coal production has been increasing, and the PRB Coal Review projects that the trend would continue, as shown in tables 4-2 and 4-3. Similarly, the demand for pipeline capacity would vary with market conditions as well as with the rate of depletion of the oil or gas resource.

Potential direct effects of projected development on roads and highways would include increased vehicular traffic and risk of traffic accidents on existing roadways in the Task 3 study area from daily travel by workers and their families. Indirect effects would include increased wear and tear on existing roads, additional air emissions from vehicles, additional fugitive dust from roads, noise, increased potential access to remote areas, and an increased risk of vehicle collisions with livestock and wildlife. Direct effects on railroads, pipelines, and transmission lines primarily would include increased demand for capacity to move coal, oil and gas, and electricity from production locations in the study area to markets outside the area. As described in section 3.15, Kiewit does not anticipate increasing the current average annual coal production rate or hiring additional employees, so no increases in road or rail traffic are anticipated under either action alternative. Indirect effects would include potential impacts of the accumulation of coal dust and fines blowing or sifting from moving, loaded rail cars. A collaborative effort between the

National Coal Transportation Association, the mines, and the BNSF and UP railroads is resulting in measures to reduce coal dust emissions from loaded, moving rail cars.

The socioeconomic analysis conducted as a part of the 2005 Task 3C analysis projects a population increase of approximately 48% between 2003 and 2020 in Campbell County under the upper coal production scenario (BLM 2005a). Campbell County accounts for most of the population in the Task 3 study area. Based on traffic studies conducted independently of the PRB Coal Review, vehicle miles traveled tend to increase at or above the rate of population growth. Consequently, highway traffic would be expected to increase by at least 48% by 2020. Approximately 60% of the population growth would occur in or near Gillette, which would indicate that the same proportion of traffic would originate in the Gillette area. The remainder of the traffic growth would be dispersed throughout the study area. Under this scenario, the greatest impact on traffic would occur in the Gillette area, where existing traffic volume to capacity ratios are highest. The increased traffic would be expected to cause delays in the Gillette area and might require widening of some streets and roads or other measures to increase traffic capacity. It is anticipated that there would be an increase in the risk of traffic accidents approximately proportional to the increase in traffic. Highway capacity on major routes away from Gillette would be expected to be sufficient to accommodate the growth without substantial constraints.

Existing rail lines, together with proposed upgrades on the joint BNSF and UP line, would be expected to accommodate the projected coal transportation traffic through 2015 (table 4-30). The updated Task 2 Report (BLM 2009c) projects that the proposed DM&E line would be built and operational by 2015 (pending completion of additional environmental analysis), which would add 100 million tons per year in additional shipping capacity for the South Gillette and Wright subregions.

Table 4-30. PRB Rail Lines Coal Hauling Capacity and Projected Use

	2010 Projected			2015 Projected			2020 Projected		
	2010 Capacity	Rail Use Increase[a]		2015 Capacity	Rail Use Increase[a]		2020 Capacity	Rail Use Increase[a]	
Rail Line	mmtpy	mmtpy	%	mmtpy	mmtpy	%	mmtpy	mmtpy	%
North BNSF	250	62–78	25–31	250 74–	104	30–42	250 78–	121	31–48
South BNSF & UP	450	349–398	79–88	600 381	–4,392	64–732	600 417	–4,552	70–762
DM&E	0 0 0			—[b]	—[c]	—[c]	—[c]	—[c]	—[c]

mmtpy = million tons per year

[a] The range of increase in use shown for each year reflects the increases that are projected for the Lower and Upper Coal Production Scenarios, respectively.

[b] The DM&E is assumed to be built and operational by 2015, adding 100 mmtpy of capacity for the mines served by the BNSF & UP South line.

[c] The BNSF & UP South line figures represent the projected combined traffic and percent capacity on the BNSF & UP South line and the projected DM&E line.

Source: updated Task 3D Report (BLM 2009g).

An estimated 1,380 MW of new power plant production capacity and 250 MW of new wind energy production capacity are anticipated in the Task 2 study area by 2015. One new 300-MW wind energy project and potentially up to 700 MW of additional power generation provided by

coal-fired power plants is projected for 2020. However, specific location(s), capacities, and effects on the existing system cannot be determined at this time.

4.2.13 Socioeconomics

The cumulative socioeconomic impact analysis focuses on Campbell County, but also considers Converse, Crook, Johnson, Sheridan, and Weston counties as directly affected and Niobrara and Natrona counties as indirectly affected. Recent and projected socioeconomic conditions are described in more detail in the 2005 Task 1C and 3C reports (BLM 2005d and 2005a).

REMI Policy Insight (REMI), a professionally recognized regional economic model, was used to develop the cumulative employment and population projections presented below. The version of the REMI model for the PRB Coal Review was comprised of two economic regions: one being Campbell County alone, the second composed of those Wyoming counties bordering Campbell County and linked to its economy by established industrial and consumer trade linkages and by work force commuting patterns. Results for the second region were analyzed to focus on the five counties (Converse, Crook, Johnson, Sheridan, and Weston) that are the most directly linked. Collectively, these five counties are referred to in the 2005 Task 3C Report (BLM 2005a) as the surrounding counties. Additional analysis was undertaken to translate the population and employment forecasts for each of the surrounding counties into housing needs and to project future school enrollment.

During the 1970s and early 1980s, the PRB emerged as a major coal producing region. Federal coal leasing has been a high profile activity because over 90% of the coal resources in the PRB are federally owned. The surface coal mines that developed during that time are now mature operations that provide a stable economic and social foundation for the region. While energy development has produced periodic surges in population, followed occasionally by population declines in some communities, the growth in domestic energy consumption, coupled with the PRB's vast energy resource base, has resulted in a 50-year growth trend in the region without the severe economic dislocations that have characterized other resource booms in the western United States.

This period of extended energy development has been accompanied by substantial economic changes and benefits, including economic growth, employment opportunity, tax revenue growth, and infrastructure development for local governments, both locally and across Wyoming, funded by tax revenues generated by coal production and other energy resources. At the same time, periods of rapid growth have stressed communities and their social structures, housing resources, and public infrastructure and service systems.

The emergence of the coal and other energy resource development industries in the PRB has had long-term cumulative effects on regional social and economic conditions. In general, Campbell County and the entire PRB region have developed an enhanced capacity to respond to and accommodate growth. The regional coal industry also provides a measure of insulation from dramatic economic and social dislocations. Key cumulative social and economic conditions identified in the PRB Coal Review are described below.

4.2.13.1 Employment and the Economic Base

Energy resource development since 1970 has resulted in substantial economic expansion across the PRB. Total employment expanded by 163% as 40,674 net new jobs were added between 1970 and 2004. The most rapid expansion occurred between 1975 and 1980. After modest growth and a slight decline in the 1980s and early 1990s, employment growth resumed in the late 1990s, led by increases in coal mine employment, including subcontractors, and CBNG development. Across the six-county area, total employment was 65,597 in 2004. Nearly half of the net job gain occurred in Campbell County, where total employment increased from 6,026 jobs in 1970 to 25,921 jobs in 2004. Strong gains also were posted in Sheridan County (9,821 jobs) and Converse County (4,421 jobs).

The economic stimuli associated with the gains in mining and CBNG employment and the long-term population growth triggered secondary job gains in construction, trade, services, and government. In 2004, business and consumer services accounted for 51% of all jobs in the region, while mining and government accounted for 14% and 16% of all jobs, respectively. Farm employment in the region, as a share of total employment, declined from 14% in 1970 to 5.0% in 2004. However, that shift is primarily because of growth in non-farm employment rather than declines in farming, as total farm employment in the PRB recorded a net decline of only 375 jobs, from 3,571 to 3,196 (U.S. Bureau of Economic Analysis 2006).

The largest impetus to future growth over the PRB Coal Review study period (2003 to 2020) was expected to occur by 2010. Under the lower production scenario, employment in 2010 related to coal mining, oil and gas production, and oil field services is projected to increase by one-third, or more than 2,300 jobs, as compared to 2003 levels. Many of the jobs gained would be the result of increased oil and gas development. While the number of coal mining jobs would increase, the projected coal-mine-related productivity gains would limit increases in the number of mine employees required for operations.

Beyond 2010, total mining industry employment would decline as major infrastructure development (e.g., additional CBNG compression capacity) is completed and the pace of conventional oil and gas drilling decreases. Increases in CBNG production and coal mining employment would occur thereafter, such that total mining employment would approach pre-2010 levels by the end of the forecast period (2020). Under the development scenarios, construction of three new power plants, having a combined capacity of 1,000 MW and a peak work force of approximately 1,550 in 2007–2008, is assumed to occur concurrently with the increases in mining employment. Under the upper production scenario, a second temporary construction work force impact would occur between 2016 and 2020 in conjunction with the construction of an additional 700-MW power plant.

The net effects of these activities, including secondary effects on suppliers, merchants, service firms, state agencies and local government in the region, would be the creation of more than 8,700 new jobs between 2003 and 2010. Of those, more than 5,600 jobs (a 22% increase over 2003) would be based in Campbell County. The pace of economic expansion, at least in terms of jobs, would moderate after 2010. Total employment growth of 2,017 additional jobs is projected in Campbell County between 2010 and 2020, with 1,741 additional jobs projected in the surrounding counties.

However, to achieve the projected levels of energy and mineral development activity through 2010 assumes that industry has access to the necessary equipment, materials, labor, and other vital inputs. Current oil and gas exploration and development across the Rocky Mountain region has absorbed the available inventory of drilling rigs and crews. A lack of access to resources could delay or limit the job gains below the levels projected, even though prospects for such growth remain. Furthermore, competition for equipment, combined with tight labor markets, could negate the productivity gains that underlie the projections, such that the employment and associated impacts do materialize, but are associated with lower levels of activity (e.g., a lengthier construction period for a power plant or fewer new wells drilled each year).

Employment effects associated with the upper coal production scenario, assuming productivity gains in coal mining equivalent to those in the lower coal production scenario, would result in total employment gains of 11,563 jobs by 2010 in the six-county study area, with an additional 3,667 jobs by 2020[4]. As compared to the employment projections under the lower coal production scenario, those gains include 2,821 additional jobs in 2010 and 3,214 additional jobs in 2020. Most of the incremental gains would be in Campbell County, further stressing labor markets, housing, and other community resources. Such pressures could delay or affect the development plans of individual firms and operators, such that the projected employment levels would not be realized in the time frames shown. Nonetheless, substantial growth in employment is expected to occur, and even if the projected total employment levels are not realized, substantial social and economic impacts still would be anticipated.

The economic stimuli associated with the projected development also would stimulate increases in employment in other nearby counties beyond the five surrounding counties identified above. However, the potential effects in these areas are not addressed in the 2005 Task 3C Report (BLM 2005a), because most of the effects would comprise indirect or induced growth that would be limited in scale relative to the size of the respective economies. Furthermore, the economic outlook for those areas is influenced by factors that are beyond the scope of this study, such as the role of the oil and gas support services industry based in Natrona County in supporting energy development in the south-central and southwestern portions of Wyoming.

4.2.13.2 Labor Market Conditions

Labor market conditions in the PRB reflect a generally healthy economy, with average annual county unemployment rates between 2.1% (Campbell) and 3.5% (Weston) in 2006. Statewide and national unemployment rates for the period were 3.2% and 4.6%, respectively (U.S. Bureau of Labor Statistics 2007).

Over time, local unemployment levels and rates have reflected the influences of the large, relatively stable employment baseline associated with the region's coal mining industry and the more transitory and variable influences of natural gas development. Prior to the onset of CBNG development in 1989, unemployment in Campbell County fluctuated between 4.8 and 5.3%,

[4] The number of jobs in the coal mining industry under the upper production scenario was estimated assuming future productivity gains comparable to those used for the lower production scenario. This approach differs from that described for the upper production scenario in the Task 2 Report, whereby a 16% higher production would be achieved with a 2.5% increase in workforce. Although that assumption reflects a continuation of historic productivity gains, it may underestimate population and employment growth and related socioeconomic effects if the production levels are achieved but productivity lags. Using the productivity gains from the lower production scenario provides a more conservative perspective on potential long-term population growth for purposes of the cumulative analysis.

slightly above the corresponding statewide averages. Labor demand associated with CBNG development contributed to a decline in unemployment to below 3.0% in the 2001. As the pace of CBNG development stabilized, labor demand eased and unemployment rates climbed to 3.7% in 2003, before again falling to current record lows.

The employment effects identified above indicate substantial pressures on local labor markets. Strong demand for labor would maintain low unemployment, creating upward pressure on wages and salaries. Those influences would stimulate substantial economic migration into Campbell County, causing impacts on population, housing demand, and other economic and social conditions. Similar influences would occur in surrounding counties, although the implications are less severe because the scale of effects would be smaller and would be distributed over multiple communities and service providers.

4.2.13.3 Personal Income

A benefit associated with energy resource development, whether it is mineral mining or oil and gas development, is local wages and salaries that are among the highest in the state. Personal income registered strong gains across the region, but especially in Campbell County, during the late 1970s and early 1980s. In 1981, per capita personal income in Campbell County was $17,520, compared to the national average of $11,280 and the statewide average of $12,879. Personal income growth was tempered by several years of economic stagnation during the late 1980s. Renewed economic vitality since then resulted in per capita personal income in Campbell County reaching $33,388 in 2004. Those gains notwithstanding, per capita income among Campbell County's residents was below statewide and national norms, as well as that for Sheridan ($35,716) County. When measured on a median household or family income basis in the 2000 census, Campbell County led statewide, national, and other counties in the PRB by considerable margins. That pattern has been maintained because of the strong economic growth in the region; in 2006, the median household income in Campbell County was $60,800 compared to a statewide median of $43,785 and national median of $44,374. Median household incomes for the other five PRB counties ranged from $40,195 to $46,883 (U.S. Census Bureau 2006b).

In terms of total personal income, Campbell County led the six-county region with $1.22 billion in 2004. Sheridan County residents recorded aggregate personal income of $972 million in 2004. Total personal income in the other counties was substantially lower, ranging from $193 million in Crook County to $389 million in Converse County.

Personal incomes in the region would increase over the period 2007–2020, both in aggregate and on a per capita basis, in conjunction with the economic outlooks foreshadowed by the projected development scenarios. In 2004, total personal income in the six-county area was $3.24 billion. Under the lower production scenario, total personal income would more than double to $7.57 billion in 2020 (in nominal dollars). The upper production scenario would generate an additional $266 million per year in Campbell County and an additional $35 to $40 million per year in the surrounding counties by 2020. Annual per capita incomes are projected to increase by approximately 27% (in real terms) across the region between 2003 and 2020. Households with one or more workers employed directly in the energy industry, associated service firms, and the construction industry likely would realize larger shares of the gains (BLM 2005a).

4.2.13.4 Population and Demographics

Population change over time is perhaps the single best indicator of cumulative social and economic change in the PRB. Campbell County was not among the original 13 counties when Wyoming was admitted to statehood, but was carved from Weston and Crook Counties in 1911. Campbell County's 1920 population of 5,233 ranked it seventeenth among Wyoming's counties. Forty years later and prior to the onset of coal development in the region, Campbell County ranked eighteenth among Wyoming's counties in terms of population, with a 5,861 residents. Neighboring Converse, Sheridan, and Weston counties had larger populations.

By 1980, Campbell County's population had increased by more than 300%, to 24,367, seventh among Wyoming's counties. Energy development contributed to population growth in Sheridan, Converse, Johnson, and Crook counties during that period. Weston County recorded a population decline during the period; however, the combined population of the PRB climbed from 49,311 in 1960 to 82,598 in 1980.

Annual coal production in the PRB has increased by nearly 560% since 1980, accompanied by expanded mine service and rail transportation capacity, stimulating further growth. The impetus for growth in local employment was tempered by substantial productivity increases in the mining industry, coupled with declining production of other energy resources. Consequently, the region's population gained a relatively modest 11%, 9,318 residents, between 1980 and 2000, reaching 91,916. Campbell County registered a net gain of 9,331 residents during that period, raising its total population to 33,698 in 2000, fourth highest in the state. Across the PRB, the loss of about 2,000 residents in Converse County was offset by modest gains in the other four counties (U.S. Census Bureau 2001).

More recently, the PRB has seen renewed population growth, primarily linked to CBNG development. Population estimates for 2006 indicate a total regional population of 100,504, a 9.3% increase over the 2000 census population. Gains were reported for all six counties, ranging from 118 persons in Weston County to 5,236 persons in Campbell County (table 4-31).

The magnitude and timing of projected employment changes from 2003-2020 under either coal production scenario would trigger corresponding effects to population across the PRB, particularly in Campbell County (figure 4-3).

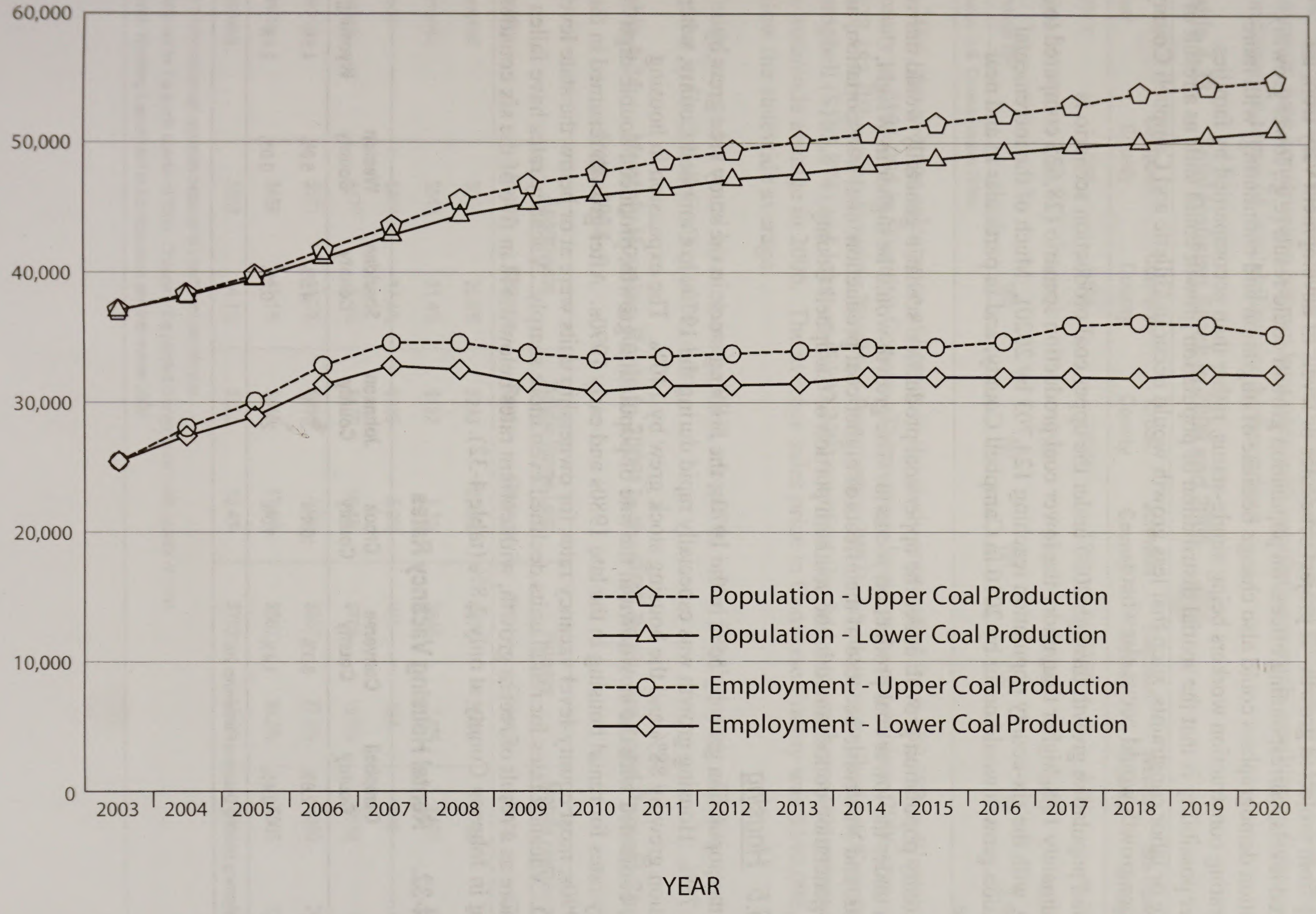
Table 4-31. Recent and Projected PRB Population

Year	Campbell County	Converse County	Crook County	Johnson County	Sheridan County	Weston County	Six County PRB Total
Census							
2000 3	3,698	12,104	5,895	7,108	26,606	6,642	92,053
2003[a]	36,381 1	2,326	5,971	7,530	27,116	6,665	95,989
2006[a] 38,9	34	12,866	6,255	8,014	27,673	6,762	100,504
2009[a] 43,9	67	13,578	6,653	8,531	29,163	7,009	108,901
Projected Lower Coal Production Scenario							
2010 45,9	25	13,103	6,542	8,389	28,459	7,108	109,526
2015 48,9	05	13,671	6,759	8,867	30,016	7,174	115,392
2020 50,9	95	14,193	6,989	9,326	31,467	7,208	120,178
Projected Upper Coal Production Scenario							
2010 47,6	62	13,160	6,570	8,424	28,579	7,137	111,532
2015 51,5	58	13,763	6,802	8,924	30,214	7,219	118,480
2020 54,9	43	14,313	7,045	9,403	31,733	7,266	124,703

[a] Projected by U.S. Census Bureau based on 2000 data.

Source: U.S. Census Bureau (2006b) and 2005 Task 3C Report (BLM 2005a).

Under the lower coal production scenario, Campbell County's population is projected to increase by more than 14,550 residents between 2003 and 2020, nearly 9,500 of which are anticipated by 2010; Kiewit does not anticipate any new hiring under either action alternative. Growth over the next three years will maintain pressures on housing and other community resources. The projected energy and mineral development in the lower coal production scenario would also result in substantial population growth elsewhere in the PRB, with Sheridan, Johnson, and Converse counties projected to gain substantial population. Population growth, like employment growth, would moderate after 2010. Projected population growth (compounded annual growth rate) between 2003 and 2020 ranges from 0.5% in Weston County to 2.0% in Campbell County. In absolute terms, the net change ranges from 537 additional residents in Weston County to a gain of 14,557 residents in Campbell County. The total population of the six-county study area is projected to climb to 120,178 in 2020, a 1.3% compounded annual growth rate.



Source : PRB Coal Review Task 3C Report (BLM 2005f)

No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Figure 4-3

Projected Campbell County Population and Employment to 2020

As with employment, changing development conditions could result in actual population growth varying from projected growth. If project schedules or levels of development vary from the projected levels, corresponding effects on population growth could result (e.g., lower growth). Population demographics could also change because of migration and commuting, with more immigrating construction workers being single-status, rather than accompanied by families. Another possibility is that the spatial distribution of population growth could shift as a result of housing or labor constraints, such that less growth would occur in Gillette and Campbell County, and more growth would occur elsewhere.

Projected population growth through 2020 under the upper coal production scenario is approximately 19% higher than under the lower coal production scenario (28,625 compared to 24,100, with the six-county population reaching 124,703 by 2020). Much of the incremental population growth would occur by 2010 in Campbell County, and in particular in and near Gillette.

Community population growth under the upper coal production scenario generally would mirror growth under the lower coal production scenario. The growth would be higher in Wright, Douglas, and Newcastle because of the effects of higher coal production, coal transportation, and power generation concentrated in the southern portion of Campbell County.

4.2.13.5 Housing

While the population grew by 55% in the 1970s, the housing stock in the study area grew by almost 78%. Housing growth was especially rapid during the 1970s in Campbell County, where population grew by 88% and the housing stock grew by 140%. The expansion in housing supply, combined with the slowdown in the rate of population growth, produced double-digit vacancy rates for rental housing in the late 1980s and early 1990s. After growth resumed in the mid-1990s, most county-level vacancy rates for ownership units were at or below the state levels in 2000. Vacancy rates for rental units declined even more sharply. Vacancy rates have fallen even more as a result of recent growth, with current rates below 1.5% in five of the six counties, and that in Johnson County at only 2.8% (table 4-32).

Table 4-32. Rental Housing Vacancy Rates

Year	Campbell County	Converse County	Crook County	Johnson County	Sheridan County	Weston County	Wyoming
2004 4Q	2.8%	8.3%	10.4%	2.1%	4.5%	5.0%	4.8%
2006 4Q	0.4%	1.4%	1.0%	2.8%	0.5%	0.0%	2.4%

Source: Wyoming Housing Database Partnership 2007.

In 2000, the housing inventory in the six-county study area was 41,203 units (table 4-33). Total housing inventory had expanded to 43,363 units in 2005, a net addition of 2,160 since 2000. However, new construction has not kept pace with population growth, resulting in tighter market conditions in terms of availability, and higher prices.

Table 4-33. Total Housing Stock in 2000 and 2005

Year	Campbell County	Converse County	Crook County	Johnson County	Sheridan County	Weston County	Six-County PRB Region
2000 1	3,288	5,669	2,935	3,503	12,577	3,231	41,203
2005 1	4,085	5,852	3,132	3,694	13,283	3,317	43,363
Change 797		183	197	191	706	86	2,160

Source: U.S. Census Bureau 2006c.

In 2005, the average sales price of homes in the study area varied from $80,303 in Weston County to $186,095 in Sheridan County. The average home price statewide in 2006 was $178,183 (Wyoming Housing Database Partnership 2007). In addition to Sheridan County, Campbell ($185,874) and Johnson ($180,209) counties also had average home sale prices above the statewide average in 2006. The average sales price in Converse County was $149,096, 17% below the statewide average.

Monthly costs for rental housing in the PRB, measured in the fourth quarter of 2006, were highest in Campbell County (table 4-34).

Table 4-34. Monthly Housing Rents in 2006[a] in the PRB Study Area and Percent Change from 2004

	Apartments		Mobile Home Lots		Houses		Mobile Homes on a Lot	
County	Rent	Change	Rent	Change	Rent	Change	Rent	Change
Campbell	$697	25.8%	$283	22.0%	$975	23.0%	$758	20.5%
Converse	$515	31.4%	$152	1.3%	$545	2.8%	$452	22.5%
Crook	$391	17.4%	$125	5.9%	N/A	N/A	N/A	N/A
Johnson	$477	-5.4%	$170	16.4%	$700	15.3%	$518	5.5%
Sheridan	$571	14.0%	$285	4.4%	$857	27.9%	$650	26.7%
Weston	$459	47.1%	$119	17.8%	$567	36.3%	$505	27.5%
Wyoming	$567	14.1%	$225	15.4%	$782	13.0%	$561	15.2%

N/A = Information not available because of insufficient sample size.

[a] Data are for the fourth quarter of 2006. Change is the percent change since fourth quarter of 2004.

Source: Wyoming Department of Administration and Information 2006.

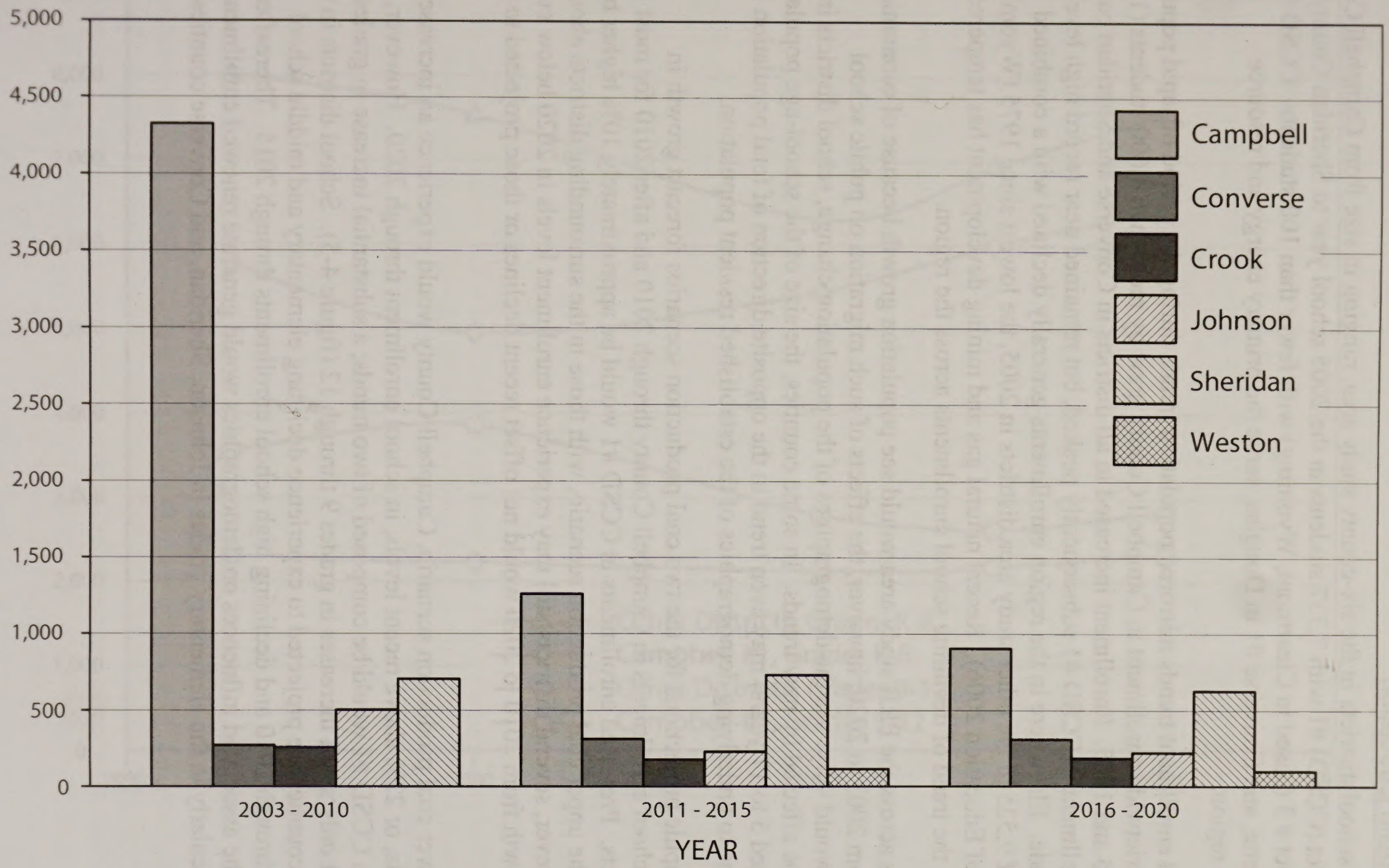
Temporary housing resources are available in the PRB in the form of hotel-motel rooms, private and public campgrounds, and vacant spaces in mobile home parks. In all, there are more than 70 lodging establishments with a total of more than 2,500 rooms. These temporary housing resources, supplemented by whatever apartments, townhouses, and mobile home spaces are available in Gillette, Wright, and Douglas, have accommodated temporary housing needs associated with natural resource and energy projects in the past.

Both projected coal production scenarios indicate a strong demand for housing across the six-county study area through 2020. Net housing requirements under the lower coal production scenario are for approximately 9,110 units through 2020, a 21% increase above the 2006 existing inventory (figure 4-4). New housing requirements under the upper coal production scenario are estimated at 10,900 units, a 25% increase compared to the 2006 inventory and 1,790 units more than for the lower coal production scenario. Approximately 60% of the overall demand for new housing through 2010 would be in Campbell County.

A substantial portion of the near-term housing demand in Campbell County would be associated with the assumed concurrent construction of three power plants. If that occurs, one or more project sponsors may be required by the Wyoming Industrial Siting Administration to proactively provide housing (e.g., a construction camp for single-status workers). Such actions could temper the needs for more housing; however, the remaining needs would be substantial, straining public and private sector residential development capacity. Although smaller in scale than those in Campbell County, housing demands in the surrounding counties may also strain the capabilities of the residential construction sector to respond. Furthermore, residential contractors would be competing for available labor, contributing to the population growth and housing demand, and fueling increases in construction costs and housing prices.

The relative scale of the housing needs can be evaluated in comparison to past growth in the study area. One benchmark for comparison is the rapid growth that occurred in the PRB in the 1970s. During that decade, the number of housing units in the six-county study area rose by approximately 14,900 units, approximately 1,500 units per year on average compared to the 850 to 975 new units per year projected under the upper and lower coal production scenarios through 2010. The rapid pace of development in the 1970s coincided with a period of economic expansion and strained the region's construction trade and building supply industries. Although the underlying economies of the region are now larger, the projected needs would tax the ability of communities to respond. Signs of strain are apparent in Gillette and could surface elsewhere as greater housing needs arise in the remaining counties of the six-county study area under the low coal production scenario.

Projected housing demands under either coal production scenario, although lower than what Campbell County and the region experienced in the "boom" years of the 1970s, would exert substantial pressure on housing markets, prices, and the real estate development and construction industries, all at a time when demand for labor and other resources would be high overall.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Figure 4-4

Projected Housing Demand in the PRB Study Area under the Lower Coal Production Scenario

4.2.13.6 Public Education

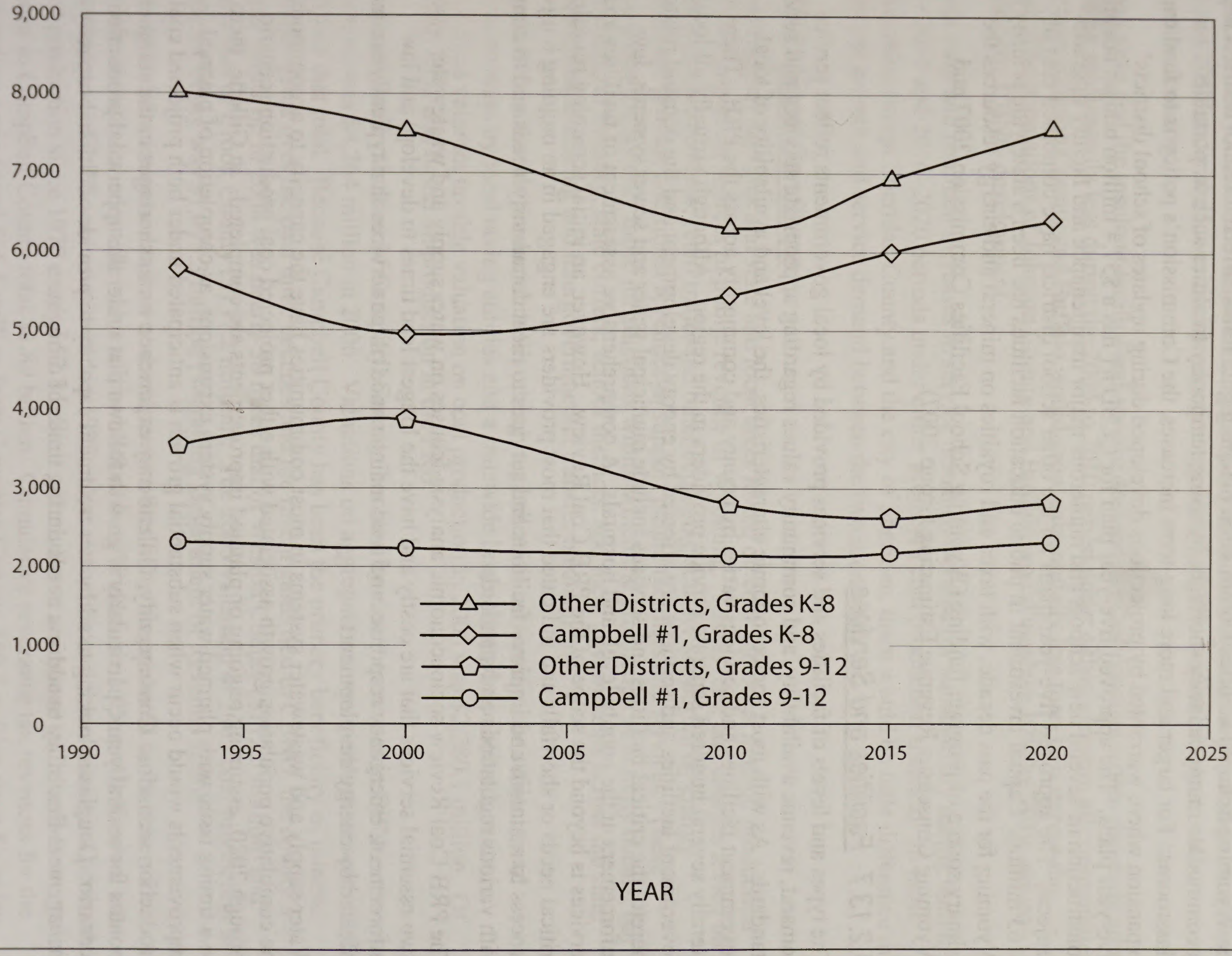
There are 10 school districts in the six-county study area, ranging in size from Campbell County School District (CCSD) #1 with 7,337 students in the 2005 school year to Sheridan County School District # 3 (based in Clearmont, Wyoming) with fewer than 100 students. CCSD #1, based in Gillette, and Converse #1 in Douglas, serve the primary energy and resource development region.

Public school enrollment trends mirrored population trends during the period of rapid population growth. Districtwide enrollment in Campbell County grew by more than 4,600 students (131%) between 1975 and 1985. Enrollment increased in all districts in Converse and Sheridan counties as well. Enrollment in CCSD #1 subsequently peaked, but remained near record high levels for nearly a decade. Elsewhere in the region enrollments generally declined with a combined enrollment of 9,525 in the other study area districts in 2005, the lowest since 1975 (Wyoming Department of Education 2006). Recent natural gas and mining development has tempered, but not reversed, the trend of declining school enrollments across the region.

Communities across the PRB study area would see population growth because of economic migration from 2003 to 2020; however, the effects of such migration on public school enrollments would vary. As the demographics of the population change, school districts in the PRB would be affected by new trends. In some counties, the size of the school-age population (generally aged 5 to 17 years) may even trend in the opposite direction of total population in the short-term due to underlying demographics of the established resident population.

The demographic projections for the two coal production scenarios forecast growth in elementary school enrollments in Campbell County through 2010 and after 2010 for most PRB school districts. Projected enrollments in CCSD #1 would be approximately 10% higher by 2020 under the upper coal production scenario, with those in the surrounding districts about 1% higher. However, several districts still may experience enrollment levels in 2020 below current levels, as growth from 2010 to 2020 would not offset recent declines or those projected to occur before 2010.

Under the lower coal production scenario, Campbell County would experience an increase of 1,587 students, or 22% above recent levels, in school enrollment through 2020. However, the net impact on CCSD #1 would be composed of two trends; a substantial increase in grades K through 8 but only small increases in grades 9 through 12 (figure 4-5). School districts in the surrounding counties are projected to experience declining elementary and middle school enrollments through 2010 and declining high school enrollments through 2015. Thereafter, growth and the associated influences on demographics would generate renewed enrollment growth, particularly in the elementary grades in Johnson, Sheridan, and Converse counties.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Figure 4-5

Projected School Enrollment Trends to 2020 under the Lower Coal Production Scenario

Under either scenario, projected enrollments may cause short-term school capacity shortages, depending on the specific grade levels and residential locations of the additional students. Under the Wyoming School Facilities Commission planning guidelines, affected school districts need to accommodate minor capacity shortages by using temporary facilities such as portable classrooms. For larger and more long-term increases, the Commission's policy is to fund capital expansion where warranted by projections developed during updates of school districts' five-year plans. The approved five-year plan for CCSD #1 has a $57.4 million budget covering construction of several new schools and numerous major maintenance and facility upgrade projects. The approved five-year plans for the other school districts have combined cost of $163 million. Capital investment in public education facilities has been a statewide priority in Wyoming for the past decade, with taxes and royalties on mineral and energy resources the primary source of program funding (Wyoming School Facilities Commission 2007 and Wyoming Consensus Revenue Estimating Group 2007).

4.2.13.7 Facilities and Services

The types and levels of facilities and services provided by local governments reflect service demand, revenue availability, and community values regarding appropriate services and service standards. As with most socioeconomic characteristics, the level and availability of local government facilities and services varies by county and community across the PRB. There are literally several hundred separate service providers in the region. Although virtually all local government facilities and services are affected by energy development and the demand related thereto, the critical facilities and services include municipal water and sewer systems, law enforcement at the county level, and hospitals. A comprehensive assessment of facilities and services is beyond the scope of the PRB Coal Review. However, an initial screening revealed no critical needs or shortfalls and indicated that most providers are engaged in an ongoing long-term process to maintain and improve facilities and services to meet community needs and to comply with various regulations and standards.

The PRB Coal Review socioeconomic analysis focuses on water supply and wastewater systems (two essential services that are costly and have the longest lead times to develop) and law enforcement, emergency response, and road maintenance (three services that typically are most affected by energy development).

Water supply and wastewater systems in most communities have the capacity to accommodate the cumulative population growth associated with either projected coal production scenario through 2020, assuming ongoing or planned improvements are completed. In Gillette, there may be a timing issue with planned water supply system expansions, as completion of planned improvements would occur when substantial growth is anticipated under both projected coal production scenarios. Consequently, Gillette may experience water shortages in the summer months for several years, particularly if growth follows that under the upper coal production scenario. Douglas is looking to add water treatment capacity to provide additional capacity and management flexibility to address needs during times of drought.

The ability to provide desired levels of services to the projected energy-related population and development is less clear in Campbell County, Gillette, Wright, and outlying rural communities. Campbell County and its communities would experience a 25% increase in population between 2003 and 2010 under the lower coal production scenario and 30% under the upper coal production scenario.

Growth rates and the resultant facility and service demand in other counties within the study area would be substantially less during the 2003 to 2010 period under either scenario; all communities other than Johnson County and Buffalo would grow substantially less than 10% during the period. The populations of Johnson County and Buffalo would increase 10% by 2010, driven primarily by CBNG development.

Growth rates and resultant increases in service demands would slow substantially during both the 2011– 2015 and 2016–2020 periods under either projected coal production scenario. In most communities except Sheridan County and the city of Sheridan, there would be little difference in population growth and service demand between the two scenarios.

4.2.13.8 Fiscal Conditions

Federal mineral royalties and state and local taxes levied on coal and other mineral production are vitally important sources of public revenue in Wyoming. Taxes, fees, and charges levied on real estate improvements, retail trade, and other economic activity supported by energy development provide additional revenues to support public facilities and services. These revenues benefit not only those jurisdictions within which the production or activity occurs, but also the federal treasury, state coffers, school districts, and local governments across the state through revenue-sharing and intergovernmental transfer mechanisms.

Coal and other minerals produced in Wyoming, regardless of ownership, are subject to ad valorem taxation by local taxing entities and a statewide levy to support public education. Statewide ad valorem taxable valuation on coal production in 2005 was $2,280.1 million. Of that total, 88% was based on production in the PRB.

The total assessed valuation of Campbell County, boosted by recent increases in CBNG production, was $4,264 million in 2006. Valuations on aggregate mineral production accounted for 87% of that total. Because Campbell County has been the primary beneficiary of mineral production gains over the past three decades and the recent gains tied to CBNG, the county's assessed valuation in 2006 was nearly 38 times that of Weston County ($112.5 million) and 31 times that of Crook County ($137.2 million). The 2006 valuation of 2005 coal production in Campbell County was $1,995.3 million (Wyoming Department of Revenue 2006).

Wyoming levies a severance tax on coal and many other minerals produced in the state. The severance tax rate, levied on the value of production, has varied from 1.0% to 10.5% over time. The current rate of 7.0% was established in 1992. Cumulative statewide severance tax proceeds on coal production since 1970 exceed $2.8 billion. Cumulative severance tax revenues on coal produced in Campbell County total $1.89 billion. Cumulative severance tax revenues for the corresponding period total $96.5 million from Converse County, $60.5 million from Sheridan County, and $758.0 million from the remainder of the state (Wyoming Consensus Revenue Estimating Group 2007; Wyoming Department of Revenue 2006).

Producers pay a 12.5% royalty to the federal treasury on the value of all surface coal production from federal leases. Total federal mineral royalties of nearly $3.3 billion have been paid on coal produced in Wyoming since 1970, approximately half of which is returned to the state. Estimated 2005 mineral royalties of about $377 million were paid on federal coal produced in the PRB (Minerals Management Service 2006).

At the foundation of the mineral development revenue projections for the period 2003 to 2020 are projected levels of future energy and mineral resource production. The projected total value of annual mineral production under the lower coal production scenario would climb by $3.49 billion (2004 dollars) over 2003 levels, reaching $8.54 billion by 2020, a 69% increase over the 2003 value. The aggregate value of energy and mineral resource production under the upper coal production scenario would increase to $9.21 billion in 2020. The incremental difference, compared to the value under the lower coal production scenario, would be $670 million per year, all of which represents the value of higher annual coal output.

The overwhelming majority of future mineral production value is anticipated to be in Campbell County. Over time, the future value of production in Sheridan and Johnson counties would climb. Total annual mineral production value by 2020 is projected to reach $6.37 billion in Campbell County and $2.17 billion in the surrounding counties. Between 2005 and 2020, total royalty and tax receipts derived from the key selected sources range between $21.1 and $22.6 billion for the lower and upper coal production scenarios, respectively. Receipts derived from coal production would account for the majority of the totals under either scenario, with federal mineral royalties on coal at $4.9 to $5.7 billion being the single largest source. Severance taxes, ranging from $6.3 to $6.7 billion, also would accrue to the state (tables 4-35 and 4-36).

Table 4-35. Summary of Mineral Development Tax Revenues Associated with Energy Resource Production under the Lower Coal Production Scenario (million $)

Industry and Taxes	2005–2010	2011–2015	2016–2020	Total
Coal[a] 3,16	4.8	3,178.9	3,756.3	10,100.0
CBNG 2,91	5.2	3,076.4	3,288.7	9,280.3
Conventional Oil and Gas	568.5	576.4	614.0	1,759.0
Totals 6,64	8.5	6,831.7	7,659.0	21,139.3
Severance Tax	1,995.9	2,012.4	2,249.3	6,257.6
Federal Mineral Royalties	2,754.1	2,839.4	3,166.3	8,759.8
State Mineral Royalties	233.5	225.8	251.4	710.7
Ad Valorem Tax (Counties)	417.6	443.0	502.8	1,363.3
Ad Valorem Tax (Schools)	1,247.5	1,311.1	1,489.3	4,047.9
Totals 6,64	8.6	6,831.7	7,659.1	21,139.3

[a] Does not include coal lease bonus bids because of the uncertainty regarding timing.

Source: 2005 Task 3C Report (BLM 2005a).

Table 4-36. Summary of Mineral Development Tax Revenues Associated with Energy Resource Production under the Upper Coal Production Scenario (million $)

Industry and Taxes	2005–2010	2011–2015	2016–2020	Total
Coal[a] 3,53	8.0	3,703.0	4,350.0	11,591.0
CBNG	2,915.2	3,076.4	3,288.7	9,280.3
Conventional Oil and Gas	568.5	576.4	614.0	1,759.0
Totals 7,02	1.7	7,355.8	8,252.7	22,630.3
Severance Tax	2,104.1	2,159.0	2,415.4	6,678.5
Federal Mineral Royalties	2,946.3	3,099.9	3,461.4	9,507.6
State Mineral Royalties	233.5	225.8	251.4	710.7
Ad Valorem Tax (Counties)	435.8	472.0	535.0	1,442.8
Ad Valorem Tax (Schools)	1,302.3	1,398.9	1,589.8	4,291.0
Totals 7,02	2.0	7,355.6	8,253.0	22,630.6

[a] Does not include coal lease bonus bids because of the uncertainty regarding timing.

Source: 2005 Task 3C Report (BLM 2005a).

The federal and state governments also benefit from coal lease bonus bids derived from future coal leasing. Bonus bids have risen over time, with successful bids for recent sales ranging from 30 cents per ton to 97 cents per ton. There is no guarantee of that trend continuing. Considerable uncertainty also exists with respect to the timing and scale of future leases, although BLM currently has pending applications for more than four billion tons of federal coal, including this application. The state receives 50% of the bonus bid revenue.

Taxes and mineral royalties levied on energy and mineral resource production accruing to the state are disbursed to the Permanent Water Development Trust Fund, Wyoming School Foundation and Capital Facilities funds, capital construction fund for state and local government facilities, and other programs according to a legislatively approved formula. Through these funds, the revenues derived from resource development benefit the entire state, not just agencies, businesses, and residents of the PRB.

County governments and school districts would realize benefits from future energy and mineral resource development in the form of ad valorem taxes. Such taxes, estimated on the basis of future coal, oil, and natural gas production, are estimated to range between $5.4 billion and $5.7 billion through 2020. Those sums do not include future property taxes levied on the new power plants, expanded rail facilities, or new residential and commercial development associated with future growth, or sales and use taxes levied on consumer and some industrial purchases. These latter revenues are not estimated in this study but would be substantially lower than those on resource production.

Local governments would benefit from property taxes on new development as well as from sales and use taxes on taxable sales within their boundaries. Such revenues are not estimated for this study because of the large number of jurisdictions and other analytical considerations.

4.2.13.9 Social Setting

The past 30 years have seen sweeping social change in the United States and throughout much of the world. But in addition to the broad forces that have driven social change in the United States as a whole, social conditions in some PRB communities have been substantially influenced by energy development. Factors that have affected social conditions in the PRB include industrial and natural resource development, economic and demographic change, housing and public infrastructure development, and institutional change at the local and state government levels.

One of the key drivers of social change in the PRB has been energy-related population growth. When the first oil boom occurred in the late 1950s, Campbell County was a relatively stable, sparsely populated rural county. Like many places in Wyoming and throughout the rural west, Campbell County was a small, relatively homogeneous ranching community (ROMCOE 1982). The oil booms of the 1950s and 1960s brought an influx of new people. Coal mine development, continued oil and gas drilling, and power plant construction precipitated another round of growth. In all, Campbell County population grew by almost 600% between 1950 and 2000.

On the one hand, this population growth, combined with a robust economy, generated a variety of positive social effects. Financial and technical resources poured into the community as it mobilized to accommodate the new population. Job opportunities were created in the construction industry, as the community responded to demands for housing, public facilities, and retail goods and services. The large and rapid influx of new residents created energy, vitality, and a sense of economic optimism about the community. Where economic advancement had been limited before the boom, there now was opportunity (Gardiner 1985).

On the other hand, it is likely that many residents had mixed feelings about these changes (Heinecke 1985). New residents brought new ideas, new ways of doing things, new preferences for goods and services, and new demands for government services. Some long-time residents, particularly those who were not directly participating in the economic benefits of energy development, viewed these changes as negative.

Today, almost any organization, committee, or government body is made up of a cross-section of energy employees, ranchers, and other community members whose tenure in the community may be long or short (Bigelow pers. comm.; Spencer pers. comm.). Moreover, because of the turnover in the energy companies, the community has become accustomed to newcomers.

Cumulative energy development in the PRB through the year 2020 has the potential to generate both beneficial and adverse effects on community social conditions. Social effects of development activities in the PRB would vary from county to county and community to community under the coal production scenarios developed for this study, based on the existing social setting and the type of development that would occur.

Beneficial social effects would be associated with an expanding economy and employment opportunities associated with energy development and resulting improvements in living standards for those employed in energy-related industries. Adverse social effects could occur as a result of conflicts over land use and environmental values. Negative social effects also could occur if the pace of growth exceeds the abilities of affected communities to accommodate energy-related employees and their families with housing and community services.

In the PRB, social conditions in Campbell County, the city of Gillette, and the town of Wright are most likely to be affected, because the county would host much of the cumulative energy development workforce, and the county and its municipalities would receive the largest increments in population growth. Campbell County and its municipalities have a long history of energy development, and they have developed infrastructure and management systems to plan for and manage growth; consequently, major adverse social effects would not be anticipated. However, under either scenario, the county and the two municipalities may face challenges in providing adequate housing and expanding community services in anticipation of population growth through 2010, particularly if several power plant and coal mine construction projects occur simultaneously. As municipalities receive only sales and use tax revenues directly from development and purchases made within their boundaries, Gillette and Wright could face challenges in securing the necessary funding to improve municipal facilities and services. Housing shortages and limitations in public services could contribute to adverse community social effects in these communities.

Many of the people who would immigrate to Campbell County for energy-related jobs are likely to share characteristics with much of the current population; therefore, few barriers to social integration are anticipated.

Social effects on other communities in the PRB are likely to be minimal to moderate. Energy-related population growth is anticipated to be moderate in other communities. Sheridan County, also familiar with coal mining, is the only other county anticipated to host a major construction project under the development assumptions used for either projected coal production scenario. Converse, Weston, and Crook counties could experience spillover growth from projects in Campbell County.

Johnson, Sheridan, and Campbell counties could experience continued conflict over split estate and water issues associated with CBNG development. The pace and scale of energy development across the PRB is likely to continue to generate social and political conflict over environmental issues under either coal production scenario.

4.2.14 Emissions and By-Products of Coal Mining and Coal-Fired Power Plants

As discussed in chapter 1, the BLM does not authorize mining by issuing a lease for federal coal, but the impacts of mining the coal are considered in this EIS because it is a logical consequence of issuing a maintenance lease to an existing mine. The use of the coal after it is mined is also not determined at the time of leasing or mining. The use of coal after it is sold is determined by the purchaser and end user of the coal; however, almost all of the coal that is currently being mined in the Wyoming PRB is being used by coal-fired power plants to generate electricity. As a result, a discussion of emissions and by-products that are generated by burning coal to produce electricity is included in this section.

As discussed in chapter 2, under the currently approved mining plan, which represents Alternative 1 (No Action Alternative), from 2009 on, the Buckskin Mine would maintain its current average coal production level of 25 million tons per year for another 14 years. Under the Proposed Action and Alternative 2, production would continue at an average of 25 million tons per year for two years and up to six years, respectively (table 2-5).

Section 3.18.2 contains estimates of GHG emissions resulting from the mining operations at the Buckskin Mine under the Proposed Action and alternatives.

4.2.14.1 Greenhouse Gas Emissions, Global Warming, and Climate Change

Climate is both a driving force and a limiting factor for biological, ecological, and hydrological processes, and has great potential to influence resource management. Climate change is a phenomenon that could alter natural resource and ecologic conditions on spatial and temporal scales. The IPCC has stated, "Most of the observed increase in global average temperatures since the mid-twentieth century is very likely due to the observed increase in anthropogenic GHG concentrations." The consensus is that as atmospheric concentrations of GHGs continue to rise, average global temperatures and sea levels will rise, precipitation patterns will change, and climatic trends will change and influence earth's natural resources in a variety of ways.

Ongoing scientific research has identified the potential impacts of anthropogenic (human-made) GHG emissions and changes in biological carbon sequestration because of land management activities on global climate. Through complex interactions on a regional and global scale, these GHG emissions and net losses of biological carbon sinks cause a net warming effect of the atmosphere, primarily by decreasing the amount of heat energy radiated by the earth back into space. Although natural GHG levels have varied for millennia, recent industrialization and burning of fossil carbon sources have caused concentrations of these gases to increase dramatically, and are likely to contribute to overall global climatic changes (Intergovernmental Panel on Climate Change 2007).

Global mean surface temperatures have increased nearly 1.33 °F from 1906 to 2005. Models indicate that average temperature changes are likely to be greater in the Northern Hemisphere. Northern latitudes (above 24° N) have exhibited temperature increases of nearly 2.1°F since 1900, with nearly a 1.8 °F increase since 1970. Without additional meteorological monitoring systems, it is difficult to determine the spatial and temporal variability and change of climatic conditions, but increasing concentrations of GHGs are likely to accelerate the rate of climate change.

In 2001, the IPCC indicated that by the year 2100, global average surface temperatures would increase 2.5 to 10.4 °F above 1990 levels. The National Academy of Sciences has confirmed these findings, but also has indicated there are uncertainties regarding how climate change may affect different regions. Computer model predictions indicate that increases in temperature will not be equally distributed, but are likely to be accentuated at higher latitudes. Warming during the winter is expected to be greater than during the summer, and increases in daily minimum temperatures are more likely than increases in daily maximum temperatures. Increases in temperatures would increase water vapor retention in the atmosphere, and reduce soil moisture, increasing generalized drought conditions, while at the same time enhancing heavy storm events. Although large-scale spatial shifts in precipitation distribution may occur, these changes are more uncertain and difficult to predict.

There are uncertainties associated with the science of climate change. This does not imply that scientists do not have confidence in many aspects of climate change science. Some aspects of climate change science are known with virtual certainty, because they are based on well-known physical laws and documents trends (EPA 2008b). Several activities contribute to climate

change, including emissions of GHGs (especially CO_2 and methane) from fossil fuel development, large wildfires and activities using combustion engines; changes to the natural carbon cycle; and changes to radiative forces and reflectivity. GHGs will have a sustained climatic impact over different temporal scales. Recent emissions of CO_2 can influence climate for 100 years (EPA 2008b; BLM 2005g).

In some cases it is difficult to discern whether global climate change is already affecting resources in the analysis area; however, information is available on potential or projected effects of global climate change on resources. It is important to note that projected changes are likely to occur over several decades to a century. Therefore, many of the projected changes associated with climate change may not be measurable within the reasonably foreseeable future. Unevenly distributed effects of climate change include altered weather patterns, sea levels, precipitation rates, wildfire occurrences, seasonal timing, desert distribution, and plant and animal distribution changes.

Climate change analyses are comprised of several factors, including GHGs, land use management practices, and the effects of reflectivity. The tools necessary to quantify incremental climatic impacts of specific activities associated with those factors are presently unavailable. Consequently, the impacts of specific anthropogenic activities cannot be assessed. Additionally, specific levels of significance have not yet been established. Therefore, climate change analysis in this document is limited to accounting and disclosing factors that contribute to it. Qualitative and quantitative evaluations of potential contributing factors within the Hay Creek II general analysis area are included where appropriate and practicable.

Chapter 3 identifies the effects of recent global climate change on the environment in the general analysis area. It is assumed that existing land and resource conditions within the general analysis area have been and would continue to be affected by climate change under all alternatives. Existing climate forecast models are not at a high enough resolution to estimate potential impacts of climate change within the PRB. Reference has been made to national and regional data that are available, including the recent comprehensive report, *The Effects of Climate Change on Agriculture, Land Resources, Water Resources and Biodiversity in the United States* (U.S. Climate Change Science Program 2008a).

To the extent that emission data were available or could be inferred from representative type data, potential GHG emissions that could result from mining of a tract under the Proposed Action or Alternative 2 have been identified, as well as emissions that would result from selection of the No Action Alternative.

The following analysis evaluates the action alternatives and their contribution to cumulative effects on the environment of past and projected development activity. This analysis assumes that coal mining would proceed in accordance with permit conditions, and that the coal would be sold in response to national and international demand. Historically, these users have been coal-fired power plants that generate electricity in the United States, although there are recent efforts towards sales outside the country; coal from the Buckskin Mine is not sold internationally. The coal market is open and competitive, and users can buy from the most cost-effective suppliers to meet their needs. The BLM does not determine the destination of this coal, and the consumer of the coal determines its use. Power plants in the United States where this coal has been used have a variety of coal combustion technologies and emission controls. All

these utility companies are licensed by the appropriate regulatory authorities and operate under necessary permit requirements in compliance with regulations.

Assuming that all coal produced would be burned to generate electricity, GHG emissions that could be attributed to coal production resulting from mining the proposed tract or an alternative tract configuration, as well as from the forecast coal production from all coal mines in the Wyoming PRB, were estimated. This was done by relating the portion of coal mined to the total emission of GHG from all coal mined in the United States. Assuming that all PRB coal would be used for coal-fired electric generation as part of the total U.S. use of coal for that purpose, gives an upper estimate of the GHG expected to result from coal recovered from the proposed tract or alternative tract configuration and for total coal production forecast for the entire PRB. As mentioned previously, specific levels of significance have not been established for GHG emissions. Given the state of the science, it is not possible to associate specific actions with the specific climate impacts. Since tools necessary to quantify incremental climatic changes associated with GHG emissions are unavailable, conclusions as to the magnitude or significance of the emissions cannot be reached. The specific effects of this action are somewhat speculative given the current state of the science. The impacts of climate change represent the cumulative aggregation of all worldwide GHG emissions, land use management practices, and the effect of reflectivity. This analysis provides a meaningful context and measure of the relative significance of coal use from the mining a maintenance coal lease and overall projected PRB coal production on total GHG emissions.

The National Assessment of the Potential Consequences of Climate Variability and Change, an interagency effort initiated by Congress under the Global Change Research Act of 1990 (Public Law 101-606), has confirmed that climate changes can also affect other aspects of the environment. The Synthesis Report, the final part of the Fourth Assessment Report of the IPCC (available at http://www.ipcc.ch), was released in preliminary form on November 17, 2007. The Synthesis Report (Bernstein et al. 2007) summarizes the results of the assessment carried out by the three working groups of the IPCC. The report included the following observations and projections.

- Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperature, widespread melting of snow and ice, and rising global average sea level.
- Observational evidence from all continents and most oceans show that many natural systems are being affected by regional climate changes, particularly temperature increases.

The term global warming refers to surface air temperature changes that are a response to increasing atmospheric GHG concentrations, along with other climate-influencing factors (National Oceanic and Atmospheric Administration 2007). From 1850 to present, historic trend data show an increase of 1 ° Celsius (C) (1.8 °F) in global mean temperature. However, the warming is not uniform throughout the world, and it is not the same during all seasons of the year. There have been extended periods (decades) where temperature has dropped or stayed constant. This historic warming over that same period has caused sea levels to rise by an average of about 20 centimeters (7.9 inches) and has resulted in changes in climate patterns on land. In some areas near the equator, temperatures have cooled by about 5 °C (8.75 °F), while closer to the poles, temperatures have risen by equal amounts (Hansen and Lebedeff 1987). In northern

latitudes (above 24° N), temperature increases of nearly 1.2 °C (2.1 °F) have been documented since 1900.

The IPCC Fourth Assessment Report found that the "…projected warming in the twenty-first century shows scenario-independent geographical patterns similar to those observed over the past several decades. Warming is expected to be greatest over land and at most high northern latitudes, and least over the Southern Ocean and parts of North Atlantic Ocean." Observations and computer models agree that arctic surface air temperatures are warming twice as fast as the global average, which is due partly to what is called the ice-albedo[5] feedback (National Oceanic and Atmospheric Administration 2007). Because temperature is a part of climate, global warming is both an element of and a driving force behind climate change.

There has been, and continues to be, considerable scientific investigation and discussion as to the causes of the recent historic rise in global mean temperatures, and whether the warming trend will continue.

Human population doubled to 2 billion from 1780 to 1930, and then doubled again by 1974. The atmospheric concentrations of GHGs have increased as human populations have increased. More land and resources were used to provide for the needs of these populations. As human activities have increased, carbon-based fuels have been used to provide for those additional energy needs. Forests and vegetation were cleared in order to provide for food production and human use.

CO_2, methane, water vapor, ozone, and nitrous oxide are the major GHGs, although there are other gases that are considered GHGs. These GHGs are released into the atmosphere and prevent the escape of reflected solar radiation and heat from the earth's surface. Through complex interactions on a regional and global scale, these GHG emissions and net losses of biological carbon sinks (i.e., forests) cause a net warming effect of the atmosphere, primarily by decreasing the amount of heat energy radiated by the earth back into space. In this way, the accumulation of GHGs in the atmosphere exerts a "greenhouse effect" on the earth's temperature. Like glass in a greenhouse, these gases trap radiation from the sun and act as an insulator around the earth, holding in the planet's heat. The present CO_2 concentration of about 385 parts per million is about 30% above its highest level over at least the last 800,000 years. The average temperature in the United States has increased by about 2 °F over the last 50 years, which is more than the global average temperature increase (U.S. Global Change Research Program 2009).

The IPCC reports the following in its Synthesis Report (Bernstein et al. 2007).

- Global atmospheric concentrations of CO_2, methane, and nitrous oxide have increased markedly as a result of human activities since 1750 and now far exceed preindustrial values determined from ice cores spanning many thousands of years.
- Atmospheric concentrations of CO_2 (379 parts per million) and methane (1,774 parts per billion) in 2005 exceed by far the natural range over the last 650,000 years. Global increases in CO_2 concentrations are due primarily to fossil fuel use, with land use change providing another significant but smaller contribution.

[5] Albedo is a term used to describe the fraction of sunlight reflected by an object.

- Most of the observed increase in globally averaged temperatures since the mid-twentieth century is very likely because of the observed increase in anthropogenic GHG concentrations. It is possible that this type of warming has been significant over the past 50 years averaged over each continent (except Antarctica).
- There is high agreement and much evidence that with current climate change mitigation policies and related sustainable development practices, global GHG emissions will continue to grow over the next few decades.
- Continued GHG emissions at or above current rates would cause further warming and induce many changes in the global climate system during the twenty-first century that would be larger than those observed during the twentieth century.
- There is high confidence that by mid-century, annual river runoff and water availability are projected to increase at high latitudes and in some tropical wet areas and decrease in some dry regions in the mid-latitudes and tropics. There is also high confidence that many semi-arid areas (e.g., Mediterranean Basin, western United States, southern Africa and northeast Brazil) will suffer a decrease in water resources as a result of climate change.
- Anthropogenic warming and sea level rise would continue for centuries as a result of the time scales associated with climate processes and feedbacks, even if GHG concentrations were to be stabilized.
- Anthropogenic warming and sea level rise could lead to some impacts that are abrupt or irreversible, depending upon the rate and magnitude of the climate change.
- A high level of agreement and much evidence support that all stabilization levels assessed can be achieved by deployment of a portfolio of technologies that are either currently available or expected to be commercialized in coming decades, assuming appropriate and effective incentives are in place for their development, acquisition, deployment and diffusion and addressing related barriers.

Relatively steep elevation gradients between valley floors and adjacent mountain ranges in the western United States produce considerable geographic climate variability. Warm, dry, semiarid conditions are typical on valley floors; moist and cool conditions are typical in higher parts of mountain ranges. Different plant communities occur within specific elevation zones. Patterns of historic climatic variation in these areas have occurred for more than 25,000 years, during which plant communities gradually shift to higher or lower elevations and north and south depending on the direction of temperature and precipitation changes (Tausch et al. 2004; Jackson and Overpeck 2000).

Temperature changes can result in shifts of weather patterns (rainfall and winds), which may affect vegetation and habitat. If climate change trends continue into the foreseeable future, Chambers (2006) and the 2008 report by the U.S. Climate Change Science Program indicate that the following changes may be expected to occur in the West.

- The amount and seasonal variability of precipitation would increase over most areas. IPCC (2001) climate model scenarios indicate that by the year 2100, precipitation would increase about 10% in summer, about 30% in fall, and 40% in winter. Less snowfall would accumulate in higher elevations, more precipitation would occur as rain, and snowmelt would occur earlier in the spring because of higher temperatures.

- Streamflow patterns would change in response to reduced snowpack and increased precipitation. Peak flows in spring would occur earlier and be of lower magnitude because of snowpack changes. Runoff from greater amounts of winter rainfall would cause higher winter flows. Summer flows would be lower, but with higher variability depending on the severity of storm events.
- Some populations of native plants, invasive species, and pests would increase. Increasing amounts of atmospheric CO_2 and precipitation during the growing season would provide favorable growth conditions for native grasses, perennial forbs, woody species, and invasive annuals such as cheatgrass. Insect populations also would increase because milder winter temperatures would improve reproduction and survival rates.
- Fire frequency, severity, and extent would increase or decrease because of the changed availability of fine fuels (grasses, forbs, and invasive species) and altered accumulation of fuels from previous growing seasons. Higher temperatures could extend the length of fire seasons. Expansion, constriction and shifting of species ranges and changes in plant communities and densities will change the number and location of wildfires. Higher rates of insect damage and disease also may increase fuel accumulations.
- Sensitive species and overall biodiversity would be reduced. High-elevation habitats would shrink in area or disappear as lower-elevation plant communities expand. Some mammalian, avian, and other species that currently occupy these high-elevation habitats could become extinct. Higher rates of disease and insect damage also may pose threats to other sensitive plant and animal species.

Global climate models exist that project/predict future temperature changes under various scenarios. For example, atmospheric CO_2 concentration increasing by 1% per year would be an idealized scenario. The sensitivity of any climate model is calculated as the amount of temperature change the model produces for a doubling of atmospheric CO_2 concentration. Most recent models have sensitivities of more than 2 °C for a doubling of CO_2 concentration (U.S. Climate Change Science Program 2008b). Scenarios cannot include unknowable events such as volcanic eruptions and variations in solar activity. Perhaps the single largest uncertainty in determining the climate sensitivity to either natural or anthropogenic changes is clouds; their effects on radiation and their role in the hydrological cycle (Intergovernmental Panel on Climate Change 2007). The rate of heat uptake by the oceans is also an uncertainty when considering climate responses on time scales shorter than 100 years (U.S. Climate Change Science Program 2008b). Despite such uncertainties, models are however consistent in their prediction of climate warming under GHG increases (Intergovernmental Panel on Climate Change 2007).

Climate change models cannot be used to predict future climate changes at any particular scale less than globally. According to IPCC's Fourth Assessment Report (2007), there is considerable confidence that climate models provide credible quantitative estimates of future climate change, particularly at continental scales and above, but the changes projected by global models decreases at smaller scales. Models are becoming more comprehensive and sophisticated in representing observed climate and past climate changes; however, models continue to have significant limitations that lead to uncertainties in magnitude and timing, as well as the regional details of predicting climate change (Intergovernmental Panel on Climate Change 2007). By taking the average of all models, known as the ensemble approach, a more accurate representation of the climate emerges (U.S. Climate Change Science Program 2008b).

4.2.14.2 Cumulative Effects of Combustion of PRB Coal by Power Plants

Historically, the coal mined in the PRB has been used as one of the sources of fuel to generate electricity in power plants located nationwide. Relatively little PRB coal, about 2%, is burned in Wyoming.

In 2008, Wyoming coal went to 36 states besides Wyoming, although it can also be shipped overseas. Over 95% of coal produced in the PRB is sold in an open market where coal is purchased on short-term contracts or spot prices based on a coal feed stock that is suitable for each buyer's power generating facility. Power plant buyers attempt to buy coal from suppliers at the most economical prices that meet their needs. PRB coal has competed well in this market because of its low sulfur content, providing a way for electric generators to achieve acid rain (SO_2) reduction requirements as well as lowering competitive mining costs when compared to delivered costs of coal from other coal-producing areas.

Wyoming coal production has increased more rapidly than other domestic coal. Coal coming out of the PRB is mined using surface mining methods which are generally safer, less labor intensive, and are easier to reclaim than underground mining. Rural rangelands are the areas that are predominately mined; they are reclaimed according to WDEQ's standards (section 3.9.4). PRB coal reserves are in thick seams, resulting in more production from the same disturbance area, and lower mining and reclamation costs.

During the coal leasing EIS process, it is difficult to predict who might purchase future PRB coal, how it would be used, and where it might be transported to. In the North American Electric Reliability Corporation power regions where PRB coal is sold, coal use ranges from 74.2% in the upper Midwest, to 15.6% in the northeast United States (EPA 2007d).

Some methods of generating electricity (e.g., natural gas, nuclear, hydroelectric, solar, wind, and geothermal resources) result in fewer GHG emissions than burning coal. The demand for power is increasing in the United States and throughout the world. According to a recent report by the North American Electric Reliability Council, peak demand for electricity in the United States is expected to double in the next 22 years (Associated Press 2007). Many developing countries, including China and India, rely heavily on coal to meet their rapidly increasing power demands, as coal is more economical and more available than other sources of electrical generation. Coal-burning power plants currently supply about 44.5% of the electric power generated in the United States as of 2009 (U.S. Energy Information Administration 2009c). The demand for power is increasing in the United States and throughout the world. In the International Energy Outlook 2010, the EIA is projecting electrical generation from coal by the year 2035 to be 44% (U.S. Energy Information Administration 2010).

The regulatory mechanisms proposed under the Climate Security Act of 2008, as well as regulation of pollutants under the CAA, are imposed at the point when coal is burned and converted to electric energy.

Coal-fired power plants have been identified as principal sources of anthropogenic CO_2 emissions. The Task 2 analysis assumed that all PRB coal is part of the total U.S. consumption for electric generation. Under that assumption, CO_2 emissions attributed to PRB coal were calculated based on the percentage of coal production in that area compared to total coal production in the United States. This approach provided estimates of CO_2 emissions from the

use of the PRB coal to produce electricity under upper and lower projections for coal production scenarios in that region.

U.S. coal production increased from 1,029.1 million tons in 1990, when the Powder River Federal Coal Region was decertified, to 1,161.4 million tons in 2006, an increase of 12.9% (U.S. Department of Energy 2007a). Wyoming coal production increased from 184.0 million tons in 1990 to 444.9 million tons in 2006, an increase of 242% (Wyoming Department of Employment 1990 and 2006). The share of electric power generated by burning coal was consistently around 50% during the 16 years between 1990 and 2006. The percentage of total U.S. CO_2 emissions related to coal consumption was consistently around 36% during that same time. The percentage of U.S. CO_2 emissions related to the coal electric power sector increased from about 30% in 1990 to about 33% in 2006 (U.S. Energy Information Administration 2009d).

In 2008, the Wyoming PRB coal mines produced approximately 451.7 million tons of coal. Using factors derived from laboratory analyses, an estimated 749.6 million metric tons of CO_2 would be generated from the combustion of all of this coal before CO_2 reduction technologies were applied. This number is based on an average Btu value of 8,600 per pound of Wyoming coal using a CO_2 emission factor of 212.7 pounds of CO_2 per million Btu (U.S. Energy Information Administration 1994). The estimated 749.6 million metric tons of CO_2 represents approximately 35.3% of the estimated 2,125.2 million metric tons of U.S. CO_2 emissions from coal combustion in 2008 (U.S. Energy Information Administration 2009d). In 2008, Wyoming PRB mines accounted for approximately 38.5% of the coal produced in the U.S. (U.S. Energy Information Administration 2009a).

The EIA's 2008 Emissions of GHGs in the U.S. report (U.S. Energy Information Administration 2009d) and EIA's 2008 U.S. Coal Report (U.S. Energy Information Administration 2009a) report the following.

- CO_2 emissions represent about 83% of the total U.S. GHG emissions.
- Estimated CO_2 emissions in the United States totaled 5,839.3 million metric tons in 2008, which was a 1.5% decrease from 2006 (which was 5,928.7 million metric tons).
- Estimated CO_2 emissions from the electric power sector in 2008 totaled 2,359.1 million metric tons, or about 40.6% of total U.S. energy-related CO_2 emissions in 2008 (which was 5,814.4 million metric tons).
- Estimated CO_2 emissions from coal electric power generation in 2008 totaled 1,945.9 million metric tons or about 33.5% of total energy-related CO_2 emissions and about 82.5% of CO_2 emissions from the U.S. electric power sector in 2008.
- Coal production from the Wyoming PRB represented approximately 43.4% of the coal used for power generation in 2008, which means that combustion of Wyoming PRB coal to produce electric power was responsible for about 12.8% of the estimated U.S. CO_2 emissions in 2008.

As discussed earlier in this chapter, the Task 2 Report projects coal development for 2010, 2015, and 2020. Due to the variables associated with future coal production, two projected coal production scenarios (representing an upper and a lower production level) were developed to bracket the most likely foreseeable regional coal production level. In the low scenario, the percentage of coal use for electric generation would stay about the same, assuming that all forms of electric generation would grow at a proportional rate to meet forecast electric demand. In the high scenario, percentage of coal use would also remain about the same, but with PRB coal displacing coal from other domestic coal regions. Table 4-37 shows the estimated annual CO_2 emissions that would be produced from the combustion of all of this coal (before CO_2 reduction technologies are applied).

Table 4-37. Estimated Annual CO_2 Emissions from Projected PRB Coal Production Levels According to Task 2 Report

Projected Coal Production Scenario	Year	Coal Production Rate (million U.S. tons per year)[a]	CO_2 Emissions (million metric tons per year)[b]
Lower	2010	411	682
	2015	467	775
	2020	495	821
Upper	2010	479	795
	2015	543	901
	2020	576	956

[a] US tons (2000 pounds per ton).
[b] Metric tons (2204 pounds per ton).
Source: Updated Task 2 Report (BLM 2009c).

In the following analysis, the contribution of the pending LBAs (table 1-2) to cumulative effects on the environment by historic and projected development activity is evaluated. To do this, it is assumed that coal mining would proceed in accordance with existing permit conditions and would be sold to coal users in response to forecasts of demand. Historically these users have been electric utilities in the United States, although there is potential for sales outside the country. This coal market is open and competitive and users can buy from the most cost effective suppliers that meet their needs.

The BLM does not determine the destination of this coal, and the use of the coal is determined by the coal consumer. The electric utilities where this coal has historically been used are located throughout the United States and have a variety of coal combustion technologies and emission control systems. These systems are licensed by the appropriate regulatory authorities in their locale and operate under necessary permit requirements in compliance with regulation.

Table 4-38 shows the estimated cumulative annual CO_2e emissions produced by all mines in the PRB that currently have LBAs pending (listed in table 1-2). The cumulative emissions calculated are those associated with the actual mining operations and not from the combustion of the coal produced and sold on the open coal market.

Table 4-38. Estimated Annual CO_2 Equivalent Emissions[a] from Coal Production at PRB Mines with Pending LBAs

Source	2007	With LBA Tracts
Four South Gillette Area Coal Mines/Four LBA Tracts	0.716	1.182
Three Wright Area Coal Mines/Six LBA Tracts	1.245	2.503
Antelope Mine/West Antelope II Tract	0.225	0.348
Buckskin Mine/Hay Creek II Tract	0.197	0.197
Total 2.53	5	4.229

LBA = lease by application

[a] CO_2e in million metric tons.

Source: Love pers. comm.; Jones & Stokes 2009, WWC Engineering 2009.

Individual LBA tracts are addressed in the following EISs: West Antelope II Coal Lease Application FEIS (BLM 2008e); South Gillette Area Coal Lease Applications FEIS (BLM 2009h); Wright Area Coal Lease Applications FEIS (BLM 2010); and Hay Creek II Coal Lease Application FEIS (this document).

Under the Proposed Action and Alternative 2, the Buckskin Mine anticipates producing coal included in the proposed tract or alternative tract configuration, respectively, at currently permitted levels using existing production and transportation facilities. Estimates of GHG emissions resulting from current and projected operations at the mine under the Proposed Action and Alternative 2 are included in section 3.18.3.

The CO_2 emissions from coal purchased from the Buckskin Mine and used to generate electricity in other states would be extended; the mine does not sell coal to any foreign entities at this time. Table 4-39 shows the current (No Action) average annual coal production for the Buckskin Mine and the estimated CO_2 emissions related to burning coal at that existing level of production. The estimated annual CO_2 emissions that would be produced from burning coal recovered from the proposed tract and from an alternative tract configuration under Alternative 2 are also shown. Those estimates are based on the average current rate of annual coal production, which is not expected to change under either action alternative, and the assumption that mining would occur at that maximum permitted level until all coal resources in the leased tract are depleted. As expected, the estimate for total CO_2 emissions associated with burning new coal reserves would be greatest under Alternative 2 because of the larger potential tract size and longer mine life. Under this alternative, the Buckskin Mine could extend production by up to six years. In contrast, the average annual estimate for CO_2 emissions under Alternative 2 would be slightly lower than under the Proposed Action.

Table 4-39. Estimated Annual CO_2 Emissions Produced from Combustion of Coal Produced from the Proposed Tract or BLM Study Area

Applicant Mine/LBA Tract	Current (No Action) and Anticipated Average Annual Coal Production by Applicant Mine[a] (million tons per year)	CO_2 Emissions Related to Annual Coal Production[b] (million metric tons)	Recoverable Coal Added under Proposed Action[a] (million tons)	Mine Life Added under Proposed Action[a] (years)	CO_2 Emissions Added by Proposed Action[b] (million metric tons)		Recoverable Coal Added under Alternative 2[a] (million tons)	Mine Life Added under Alternative 2[a] (years)	CO_2 Emissions Added by Alternative 2[b] (million metric tons)	
					Total for Proposed Tract	Average per Year for Proposed Tract			Total for BLM Study Area	Average per Year for BLM Study Area
Buckskin/Hay Creek II	25.0	41.5	54.1 2 89.8			44.9	149.7	6	Up to 248.4	41.4

[a] Anticipated coal production rates at the Buckskin Mine, coal tonnages within the proposed tract and BLM study area, and anticipated number of years added to the life of the mine under each alternative are addressed in chapter 2.

[b] Determined using emission factor of 1.659 metric tons CO_2/ton of coal burned (U.S. Energy Information Administration 1994).

Despite these estimates, the actual level of CO_2 emissions produced from burning coal recovered from the proposed tract or an alternative tract configuration under Alternative 2 cannot be predicted with complete accuracy due to uncertainties about emission limits that would be in place when the new coal is mined, as well as where and how that coal would be used. As shown under the No Action Alternative in table 2-4, the Buckskin Mine projects that, after 2008, approximately 14 years of currently permitted mine life remains. More rapid improvements in technologies that provide for less CO_2 emissions, new CO_2 mitigation requirements, or an increased rate of voluntary CO_2 emissions reduction programs could result in significantly lower CO_2 emissions levels than are projected here.

The Buckskin Mine produced approximately 25 million tons of coal in 2008, or about 4% of the coal produced in the Wyoming PRB that year. Combustion of those 25 million tons of coal to produce electricity generated approximately 41.5 million metric tons of CO_2 emissions, or about 0.6% of the total estimated anthropogenic CO_2 emissions produced in the United States in 2008 (about approximately 7,052.6 million metric tons) (U.S. Department of Energy 2009d). Under the No Action Alternative, CO_2 emissions attributed to burning coal produced by the mine would continue at this approximate level for up to 14 years beyond 2008, while the mine recovers the remaining estimated 460.9 million tons of currently leased coal reserves.

Selection of the No Action Alternative would probably not result in a decrease of U.S. CO_2 emissions attributed to coal mining and coal-burning power plants in the longer term, because multiple other sources of coal are available. Although this coal does not have the cost, environmental, or safety advantages of PRB coal, it could supply the demand beyond the time that the Buckskin Mine completes coal recovery in its existing leases.

In 2006, transportation sources accounted for approximately 29% of total U.S. GHG emissions (EPA 2008c). This is the fastest growing source of U.S. GHGs, accounting for 47% of the net

increase in total U.S. emissions since 1990. Transportation is also the largest end-use source of CO_2, which is the most prevalent GHG (EPA 2008c).

CO_2 is not the only GHG of concern. Methane is a component of CBNG that is released into the atmosphere when coal is mined. The other major sources of U.S. methane emissions are from agriculture and waste management. The EIA (2007a and 2007b) reports the following.

- Anthropogenic methane emissions in the U.S. totaled 737.4 million metric tons CO_2e in 2008 and 722.7 million metric tons CO_2e in 2007.
- Methane emissions from coal mining across the nation were estimated at 82.0 million metric tons CO_2e, or approximately 11.1% of the U.S. total anthropogenic methane emissions in 2008.
- Surface coal mining operations were estimated to be responsible for methane emissions of about 15.7 million metric tons of CO_2e in 2008 in the United States. This represents about 2.1% of the estimated anthropogenic methane emissions in 2008, and about 19.1% of the estimated methane emissions attributed to coal mining of all types.
- The Wyoming PRB produced approximately 55.5% of the coal mined in the United States in 2008 using surface mining techniques, which means that Wyoming PRB surface coal mines were responsible for approximately 1.7% of the estimated U.S. anthropomorphic methane emissions that year. The Buckskin Mine contributed about 4% of the Wyoming PRB coal production in 2006. Since 1990, when the BLM began using the LBA process, total U.S. anthropogenic methane emissions declined from 783.5 million metric tons CO_2e to 737.4 million metric tons CO_2e in 2008. Total coal mining related emissions declined from 106.4 million metric tons CO_2e to 82.0 million metric tons CO_2e during the same period. The EIA attributes the overall decrease in emissions of methane to increases in coal production from surface coal mines that produce relatively little methane (U.S. Energy Information Administration 2009d).

CBNG is commercially produced on a large scale by oil and gas operators from wells located within and near the Hay Creek II general analysis area. CBNG that is not recovered prior to mining is vented to the atmosphere during the mining process. Selection of the No Action Alternative would allow more complete recovery of the CBNG from the general analysis area in the short term (roughly 14 years), during the time that the applicant mine's currently leased coal is being recovered. Under Alternative 2, a large portion of the CBNG resources in the BLM study area would be recovered prior to mining as discussed in Section 3.3.2.2. Selection of the No Action Alternative would not likely directly decrease U.S. methane emissions attributed to coal mining in the long term because multiple other sources of coal are available that could supply the coal demand beyond the time that the Buckskin Mine recovers the coal in its existing leases.

Nitrous oxide is the other GHG of concern that is associated with coal mining; however, the largest source in the United States is agricultural (about 76% comes from fertilization of soils and about 24% from management of animal waste) (U.S. Energy Information Administration 2009d).

Although the effects of GHG emissions and other contributions to global climate change can be estimated, given the current state of science it is impossible to determine what effect any amount

of GHG emissions from an activity might have on global warming, climate change, or the environmental effects stemming from it. Thus, it is not currently possible to associate any particular action and its specific project-related emissions with the creation or mitigation of any specific climate-related effects at any given time or place. However, certain actions and the effects of that action may contribute to the effects of climate change, even though specific climate-related environmental effects cannot be directly attributed to them.

4.2.14.3 U.S. Actions and Strategies to Address Greenhouse Gas Emissions

Potential regulatory policies to address climate change are in various stages of development at the federal, state, and regional levels (U.S. Energy Information Administration 2009e). A number of bills have been introduced in the U.S. Congress related to global climate change. At this time, no national policy or law is in place to regulate GHG emissions.

The Lieberman-Warner Climate Security Act, which was introduced in October 2007 by Senators Joseph I. Lieberman (ID-CT) and John W. Warner (R-VA), would establish a cap-and-trade within the United States. In short, the "cap" would set a legal limit on the quantity of GHGs that a region can emit each year and "trade" would allow companies to exchange the permission (or permits) to emit GHGs. The cap would get tighter over time, and by 2050, emissions would be reduced by 63% below 2005 levels. The Senate Environment and Public Works Committee approved the bill in December, 2007 (http://www.pewclimate.org, accessed 12/21/2007). The bill was introduced in the Senate and read the first time on May 20, 2008. The Boxer-Lieberman-Warner substitute amendment to the Climate Security Act of 2008 was released by the Senate Environment and Public Works Committee on May 21, 2008. The bill was read a second time and placed on the Senate Legislative Calendar under General Orders, Calendar No. 742. In June 2008, the U.S. Senate voted to invoke cloture on the Boxer amendment but did not pass the cap-and-trade legislation.

On June 26, 2009, the U.S. House of Representatives passed The American Clean Energy and Security Act of 2009. The legislation includes a federal GHG emissions cap-and-trade program that would take effect in 2012. The declining emissions cap requires that total GHG emissions be 17% below 2005 levels by 2020 and 83% below 2005 levels by 2050. In November 2009, the Senate Environment and Public Works Committee passed a GHG cap-and-trade bill that borrows much from the House American Clean Energy and Security Act and tightens the GHG emissions cap to 20% below 2005 levels by 2020. Several other committees are expected to weigh in before the final bill is crafted and brought before the Senate floor (U.S. Energy Information Administration 2009d).

On April 2, 2007, in *Massachusetts v. EPA*, the U.S. Supreme Court found that GHGs are air pollutants covered by the CAA. The Court held that the administrator of the EPA must determine whether emissions of GHGs from new motor vehicles cause or contribute to air pollution that may endanger public health or welfare, or whether the science is too uncertain to make a reasoned decision. The court directed the EPA to review the latest science on climate change in order to make a determination. On April 17, 2009, the EPA administrator signed the Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the CAA. On December 7, 2009, the administrator signed two distinct findings regarding GHGs. The Administrator found that current and projected concentrations of the six key well-mixed GHGs—CO_2, methane, nitrous oxide, hydrofluorocarbons (HFCs),

perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6)—in the atmosphere threaten the public health and welfare of existing and future generations and that the combined emissions of these GHGs from new motor vehicles contribute to climate change. The findings do not impose any emission reduction requirements but allow the EPA to finalize the GHG standards proposed earlier in 2009 (EPA 2009d). The agency can now regulate CO_2 as a pollutant and begin regulating GHG emissions from power plants, factories and major industrial polluters, although the details of that regulation have yet to be worked out. An endangerment finding under one provision of the CAA alone would not automatically trigger regulation under the entire Act.

Because of the Supreme Court's decision in 2007, the EPA drafted the Prevention of Significant Deterioration/Title V Greenhouse Gas Tailoring Rule. The draft rule, published in the Federal Register on October 27, 2009, limits the applicability of CO_2 emissions standards to new and modified sources that emit more than 25,000 metric tons CO_2e annually, rather than applying the threshold of 250 tons per sources for triggering the regulation of criteria pollutants specified in Title V of the CAA. At the 25,000 metric tons CO_2e annual level, the EPA expects that 14,000 large industrial sources, which are responsible for 70% of the U.S. GHG emissions, will be required to obtain Title V operating permits. That threshold would cover large power plants, refineries, and other large industrial operations (U.S. Energy Information Administration 2009d).

The EPA signed the Final Mandatory Reporting of Greenhouse Gases Rule on September 22, 2009 (EPA 2010). The rule requires suppliers of fossil fuels or industrial GHGs, manufacturers of vehicles and engines, and facilities that emit 25,000 metric tons or more per year of GHG emissions to submit annual reports to the EPA. The gases covered by the rule are CO_2, nitrous oxide, HFCs, PFCs, SF_6, and other fluorinated gases including nitrogen trifluoride (NF_3) and hydrofluorinated ethers (HFE). The EPA's new reporting system will provide a better understanding of where GHGs are coming from and will guide development of the best possible policies and programs to reduce emissions. Reporters were required to began monitoring their emissions on January 1, 2010, and the first annual emissions reports will be due in 2011 (EPA 2010).

The American Recovery and Reinvestment Act of 2009 ("The Stimulus Bill") was signed into law by President Obama on February 17, 2009, and under the Act, the DOE received $36.7 billion to fund renewable energy, carbon capture and storage, energy efficiency, and smart grid projects. The projects are expected to provide reductions in both energy use and GHG emissions (U.S. Energy Information Administration 2009d).

Federal, state, and local governments are also developing programs and initiatives aimed at reducing energy use and emissions. The 2002 Clear Skies and Global Climate Change Initiative is a voluntary national program to reduce GHG emissions. There are federal tax incentives for energy efficiency and conservation, and some states have renewable energy and energy efficiency policies. Regional initiatives have started in the northeast (Northeast Regional Greenhouse Gas Initiative) as well as the Western Climate Initiative in the western states. It is not possible to predict how all of these programs would be melded into a national regulatory process if one were to be enacted.

A number of U.S. financial and corporate interests have acknowledged that enactment of federal legislation limiting the emissions of CO_2 and other GHGs seems likely (National Association of Regulatory Utility Commissioners 2007). There is uncertainty about anticipated CO_2 emission

limits and carbon capture/sequestration regulations. This has led some proponents to cancel or delay proposed projects that use existing and emerging technologies to produce electricity from coal (Bleizeffer 2007a and 2007b). Capacity planning decisions for new generating plants and investment behavior in the electric power sector are being affected by the potential impacts of policy changes that could be made to limit or reduce GHG emissions (U.S. Energy Information Administration 2009e).

Based on the coal-related and oil- and gas-related development in the PRB study area, future development of geologic carbon sequestration could occur in the area.

4.2.14.4 Current and Future Energy Sources and Emissions of Greenhouse Gases in the U.S.

The key determinant of energy consumption is population. Population influences demand for goods, services, housing, and travel. The population in the United States has increased by about 20% and energy consumption by a comparable 18% since 1990, with variations in energy use per capita depending on factors such as weather and the economy. To meet the nationwide consumer demand and requirement for energy, coal is burned in power plants to produce electricity. Coal is an important component of the U.S. energy supply partly because it is the most abundant domestically available fossil fuel (U.S. Geological Survey 2002b). One-quarter of the world's coal reserves are found within the United States; the energy content of U.S. coal resources exceeds that of all the world's known recoverable oil; and coal resources supply more than half of the electricity consumed by Americans (U.S. Energy Information Administration 2008c and U.S. Department of Energy 2009). Many countries are even more reliant on coal for their energy needs than is the United States. More than 70% of the electricity generated in China and India comes from coal (U.S. Geological Survey 2000). The value of coal is partially offset by the environmental impacts of coal combustion (U.S. Geological Survey 2000).

In the DOE's 2007 Annual Energy Outlook, energy-related CO_2 emissions were projected to grow by about 35% from 2006 to 2030 (U.S. Energy Information Administration 2007b). By comparison, the DOE's 2008 Annual Energy Outlook projected energy-related CO_2 emissions to grow by 16%, from 5,890 million metric tons in 2006 to 6,851 million metric tons in 2030 (U.S. Energy Information Administration 2008c). However, the DOE's 2009 Annual Energy Outlook projects energy-related CO_2 emissions to grow by 7%, from 5,991 million metric tons in 2007 to 6,414 million metric tons in 2030. The mix of sources for these generation projections include coal, natural gas, nuclear, liquids (petroleum), hydro-power, and non-hydro renewables (e.g, wind, solar). The most recent, lower projected emissions growth rate is the result of a slower demand growth combined with increased use of renewables and a declining share of electricity generation that comes from fossil fuels (U.S. Department of Energy 2009b).

Total U.S. anthropogenic GHG emissions in 2008 were 2.2% below the 2007 total. The decline in total emissions—from 7,209.8 million metric tons CO_2e in 2007 to 7,052.6 million metric tons in 2008—was largely the result of a 177.8 million metric tons CO_2e drop in CO_2 emissions. Emissions of other GHGs increased by small percentages, but those increases were more than offset by the drop in CO_2 emissions. The decrease in U.S. CO_2 emissions in 2008 resulted from higher energy prices, economic contraction, and lower demand for electricity (U.S. Energy Information Administration 2009e).

Energy-related CO_2 emissions dominate (about 81% in 2008) the total U.S. GHG emissions. Petroleum is the largest fossil fuel source for energy-related CO_2 emissions, contributing 41.9% of the total, whereas coal is the second-largest fossil fuel contributor, at 36.5%. Petroleum made up 44.6% of total fossil fuel energy consumption in 2008, as compared with coal's 26.8%. Natural gas accounted for 28.5% of the fossil fuel energy use in 2008, but only 21.4% of total energy-related CO_2 emissions. Energy-related CO_2 emissions account for 98% of the total U.S. CO_2 emissions (U.S. Department of Energy 2009a).

The United States emits about 1,900 million metric tons annually from coal-fired power plants, 33% of total energy-related CO_2 emissions, and 81% of CO_2 emissions from the U.S. electric power sector (U.S. Department of Energy 2009a). If public sentiment results in changed electric demand, or if GHG emissions are regulated, the demand forecast for coal for electric generation could change. The potential impacts of policy changes that could be made to limit or reduce GHG emissions will affect planning decisions for new power plants, particularly coal-fired facilities.

To assess the national electric generation portfolio (mix of electric generation technologies) and the mix of future electric generation technologies, the BLM reviewed the Annual Energy Outlook 2010 Report (U.S. Energy Information Administration 2009b). An independent study representing a forecast to the year 2035, it examined the ability of the domestic electric generation industry to alter the present electric generation portfolio. This report compares the 2035 projection to the electric generation mix that existed in 2008. This most recent report incorporates the 2009 downturn in electric demand, which resulted from lowered electric demand for manufacturing in the depressed domestic economy of 2009. This forecast estimated the coal-fired domestic electric generation at 44% by 2035, based on a slowing in electric demand through 2035, and a doubling, to 17%, of renewable electric generation by 2035. Based on this study, even with a considerably more optimistic projection for renewable sources, coal use continues to be projected as the largest portion of the domestic electric fuel mix.

Technologies are available for producing cleaner, more efficient, and more reliable power from coal. These include advanced pulverized coal, circulating fluidized bed, coal gasification or integrated gasification combined cycle, and carbon sequestration or carbon capture and storage technologies. Systems that use carbon capture technologies are designed to capture at least 90% of emitted CO_2, which would be stored within geological formations (i.e., oil and gas reservoirs, saline formations, unmineable coal seams). These technologies are not used commercially because of the extremely high capital costs and low system reliability—the biggest obstacles to integration of these technologies into the power market. However, regulatory uncertainties are affecting planning decisions, for example, unless new coal-fired power plants are equipped with carbon capture and storage equipment they could incur higher costs as a result of higher expenses for siting and permitting. Nuclear and renewable power plants would not be directly affected by regulatory uncertainties because they do not emit GHGs

The Electric Power Research Institute (EPRI) has also attempted to identify a scenario of how the full portfolio of technologies to provide for electric energy would respond if a national policy required CO_2 emissions to be reduced to 1990 levels (James 2007). EPRI updated this research in an October 2009 report, The Power to Reduce CO_2 Emissions: The Full Portfolio (EPRI 2009), which used the EIA's Annual Energy Outlook 2009 Report for comparison.

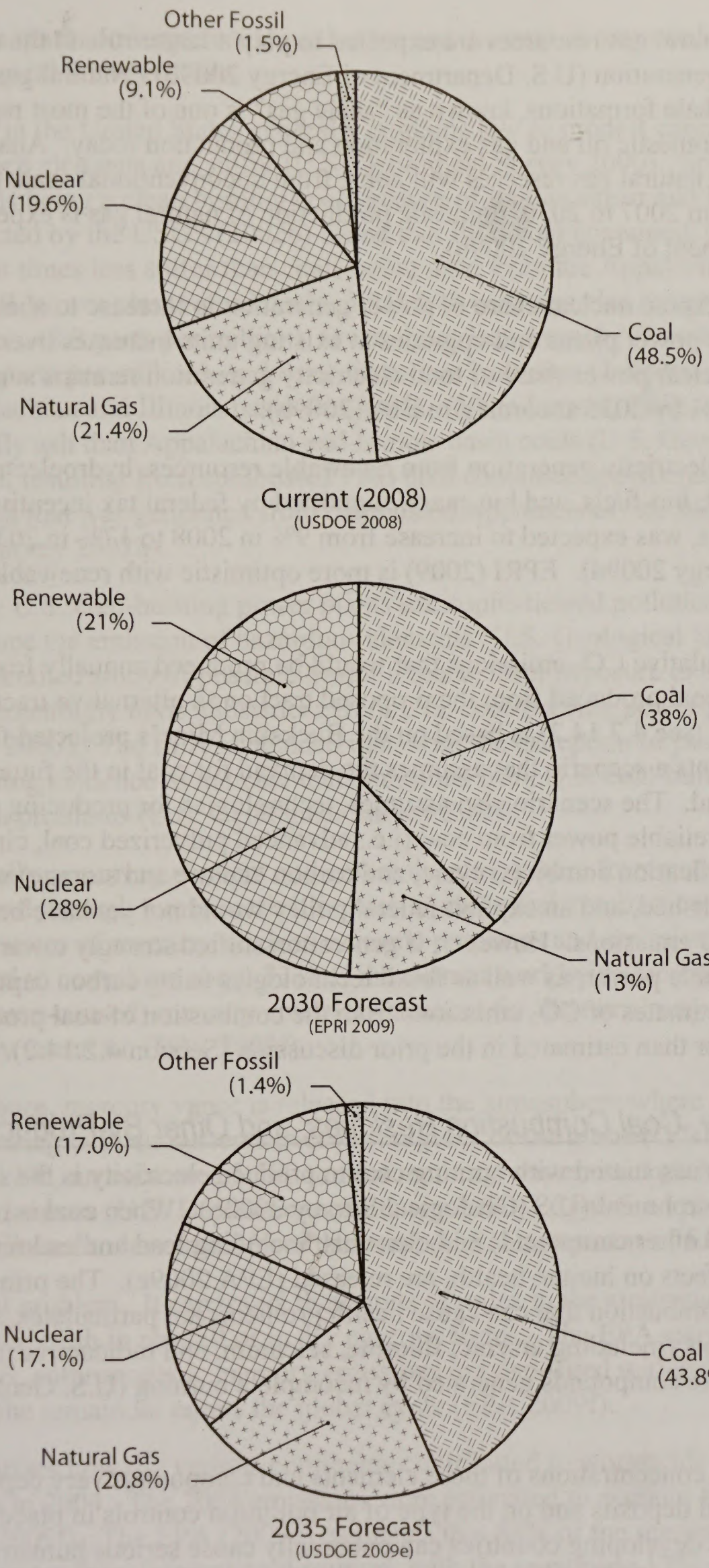
The EPRI study predicts that a national policy that forces a reduction of CO_2 emissions to 1990 levels would promote increased energy efficiency, and the growth of "non carbon" sources such as nuclear and renewable. Renewable sources include wind and solar, as well as emerging technologies like tidal power, river turbines, and others reported in the media. Hydropower is limited because most opportunities for hydropower have been used or require large infrastructure. Use of carbon based sources such as gas and petroleum are less than forecasted by the EIA, while coal use remains about the same in the EPRI forecast, mostly due to forecasted improvement in GHG emission reduction in coal fueled generation. Both the EIA and EPRI forecast an increase in electricity cost.

Figure 4-6 shows the 2008 electric generation mix, compared to the 2035 EIA forecast (U.S. Energy Information Administration 2009b) as well as the older 2030 EPRI forecast (EPRI 2009). Both forecasts agree that the amount of coal-fueled electric generation is expected to drop from nearly 50% of the present total to about 40% of the total in future years. Coal is forecast to remain as the major electric generation component until at least 2035. Renewable energy (other than hydroelectric) and nuclear are forecast to increase, while natural gas and other fossil fuels (i.e., oil) are forecast to remain stable or decrease to a degree.

In 2003, the DOE initiated the FutureGen project, a first of its kind, commercial-scale coal-fired, near-zero-emissions power plant incorporating integrated gasification combined cycle with carbon capture and storage. This is the first facility of its kind to combine and test several cutting-edge technologies. FutureGen is a public-private partnership between the DOE and the FutureGen Alliance, a non-profit organization representings some of the world's largest coal producers and electric utilities. The FutureGen Alliance and the DOE reached an agreement in June 2009 to proceed with the project, which will be located at Mattoon, Illinois. The project proposes to produce electricity by turning coal into gas, remove impurities, extract CO_2 from the waste stream, and then sequester the CO_2 underground. The Alliance is responsible for design, construction, and operation of the facility, and the DOE is responsible for independent oversight and coordinating participation of international governments. The DOE's financial contribution will come from the American Recovery and Reinvestment Act. The DOE issued a NEPA ROD on July 14, 2009, to move forward (U.S. Department of Energy 2009b). The ROD allows the Alliance to proceed with site-specific activities, and over the following 8 to 10 months the project design, costs and funding plan will be refined. When operational the FutureGen facility will produce 275 MW of power and capture 90% of the carbon emissions; however, it may be operated at a 60% capture rate in the first three years to validate plant integration and sequestration capability, as well as manage the startup risks and costs. This technology should sequester a million tons of CO_2 annually (U.S. Department of Energy 2009b).

Other methods of generating electricity that result in fewer GHG emissions than burning coal include natural gas, nuclear, hydroelectric, solar, wind, and geothermal resources.

Natural gas plays a key role in meeting U.S. energy demands. Natural gas, coal and oil supply about 85% of the nation's energy, with natural gas currently supplying about 22% of the total. The percentage contribution of natural gas to the U.S. energy supply is expected to remain constant for the next 20 years. According to EIA's 2010 Annual Energy Outlook (U.S. Energy Information Administration 2009b), concerns about GHG emissions have little effect on construction of new capacity fueled by natural gas.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Figure 4-6

Current and Forecast Mix of Electric Generation Sources

Unconventional natural gas resources are expected to play a larger role in the demand for natural gas for electricity generation (U.S. Department of Energy 2009b). Natural gas production from hydrocarbon rich shale formations, known as "shale gas" is one of the most rapidly expanding trends in onshore domestic oil and gas exploration and production today. Analysts estimate that by 2011, most new natural gas reserves will come from unconventional shale gas reservoirs (NETL 2009). From 2007 to 2030, domestic production of natural gas is expected to increase by 22% (U.S. Department of Energy 2009b).

EPRI (2009) projects the nuclear share of power generation to increase to about 28% by 2030 as the addition of new power plants and upgrades at existing units increases overall capacity and generation. The nuclear power share of total electricity generation remains somewhat constant between 17 and 19% by 2035 according to EIA (2009b).

The nation's total electricity generation from renewable resources, hydroelectricity, geothermal, solar, wind, ethanol, bio-fuels, and bio-mass, supported by federal tax incentives and state renewable programs, was expected to increase from 9% in 2008 to 17% in 2035 (U.S. Department of Energy 2009d). EPRI (2009) is more optimistic with renewable sources reaching 21% by 2030.

The estimated cumulative CO_2 emissions that would be produced annually from the conventional combustion of the coal produced from the proposed tract or an alternative tract configuration under Alternative 2 (see 4.2.14.2) is based on the Buckskin Mine's projected future mining rates. That estimate presents a scenario that assumes the demand for coal in the future would not differ from current demand. The scenario also assumes, technologies for producing cleaner, more efficient and more reliable power from coal (i.e., advanced pulverized coal, circulating fluidized bed, integrated gasification combined cycle, and carbon capture and storage) would not yet be commercially established, and an explicit federal policy would not yet have been enacted to limit or reduce U.S. GHG emissions. However, if generation shifted strongly toward natural gas, nuclear, and renewable power, as well as fossil technologies using carbon capture and storage equipment, those estimates of CO_2 emissions from the combustion of coal produced from the PRB would be lower than estimated in the prior discussion (Section 4.2.14.2).

4.2.14.5 Mercury, Coal Combustion Residues, and Other By-Products

One of the concerns associated with burning coal to produce electricity is the release of elements from coal to the environment (U.S. Geological Survey 2002b). When coal is burned, GHGs as well as mercury and other compounds and elements, including lead and cadmium, that may have direct or indirect effects on human health, are released (EPA 2009e). The principal pollutants generated by coal combustion that can cause health problems are particulates, sulfur and nitrogen oxides, trace elements (including arsenic, fluorine, selenium, and radioactive uranium and thorium), and organic compounds generated by incomplete burning (U.S. Geological Survey 2000).

In coal combustion, concentrations of these elements and compounds vary depending on the chemistry of the coal deposits and on the type of air pollution controls in place when the coal is burned. Coal use in developing countries can potentially cause serious human health impacts (U.S. Geological Survey 2000). Some coal mined in China contained high levels of arsenic, fluorine, selenium, and polycyclic aromatic hydrocarbons. This coal has caused severe, life-

threatening health impacts on some residents that burned the coal in unvented stoves in their homes (U.S. Geological Survey 2000).

Coal that is burned in the United States generally contains low to modest concentrations of potentially toxic trace elements and sulfur (U.S. Geological Survey 2000). Specifically, PRB coal is recognized as being a clean burning coal because of its low sulfur and low ash properties. An analysis conducted by the USGS (2002b) found that PRB coal contained, on average, approximately eight times less sulfur than coals being used from the Appalachian and Illinois basins to supply U.S. power plants (feed coal). PRB feed coal was also found to contain nearly half as much uranium (8.9 parts per million), seven times less arsenic (17 parts per million), five times less lead (19 parts per million), and three times less cadmium (1.1 parts per million) when compared to Appalachian and Illinois basin feed coals. When burned, PRB coal produced, on average, 38% less fly ash than Appalachian and Illinois basin coals (U.S. Geological Survey 2002b). The fly ash resulting from combusted PRB coal contained approximately 39 times less mercury than fly ash that was generated from combusted Appalachian and Illinois basin coal (U.S. Geological Survey 2002b).

Additionally, many U.S. coal-burning power plants use sophisticated pollution-control systems that efficiently reduce the emission of hazardous elements (U.S. Geological Survey 2000). The EPA conducted a detailed study of possible health impacts from exposure to emissions of approximately 20 potentially toxic substances from U.S. coal-burning power plants (U.S. Geological Survey 2000). The EPA concluded that, with the exception of possibly mercury, there is no compelling evidence to indicate that emissions from U.S. coal-burning power plants cause human health problems (U.S. Geological Survey 2000).

Mercury is a naturally occurring element and enters the atmosphere from natural sources, such as active volcanoes, and through human activities such as industrial combustion and mining (EPA 2006b). Natural sources of mercury, such as volcanic eruptions and emissions from the ocean, have been estimated to contribute about 33% of the current worldwide mercury air emissions; anthropogenic (human-caused) mercury emissions account for the remaining 67%, though these estimates are highly uncertain (EPA 2009f).

When fossil fuels burn, mercury vapor is released into the atmosphere where it may drift for a year or more, spreading with air currents over vast regions of the globe (U.S. Department of Energy 2006). In 1995, an estimated 5,500 tons of mercury was emitted globally from both natural and human sources (U.S. Department of Energy 2006). Coal-fired power plants in the United States contributed to less than 1% of that total (U.S. Department of Energy 2006).

Mercury is a global problem. It can travel thousands of miles in the atmosphere before it is deposited back to the earth in rainfall or in dry gaseous forms. The EPA estimates that about one-third of the U.S. anthropogenic mercury emissions are deposited within the contiguous United States and the remainder enters the global cycle (EPA 2009f).

Table 4-40 summarizes how the various continents contributed to worldwide human-caused mercury emissions in 2004. The 2004 emissions were estimated to account for about 3% of the global total (EPA 2009f). The EPA (2009e) estimates that 83% of the mercury deposited in the United States originates from international sources, with the remaining 17% coming from the United States and Canada. These figures include mercury from natural and anthropogenic sources.

Table 4-40. 2004 Percent Contribution to Worldwide Anthropogenic Mercury Emissions

Continent	Percent
Asia 53	
Africa 18	
Europe 1	1
North America	9
Australia 6	
South America	4

Source: EPA 2009f.

In 2006, the EPA estimated that 50% to 70% of global atmospheric emissions came from fuel combustion, and much of it came from China, India, and other Asian countries. Coal consumption in Asia is expected to grow significantly over the next 20 years. This international source of mercury emissions may grow substantially if left unaddressed. (EPA 2006b.)

Over the past decade, addressing environmental and human health mercury risks has been a focus for the EPA. Overall U.S. mercury air emissions have been reduced by 45% since 1990. The EPA is most concerned with methyl mercury, a potent form of mercury to which humans are primarily exposed. (EPA 2006b.)

Atmospheric mercury can settle into water or onto land where it can be washed into the water. Certain microorganisms can transform mercury into methyl mercury, a highly toxic mercury compound that builds up in fish and shellfish when they feed. Methyl mercury is the only form of mercury that biomagnifies in the food web. Concentrations of methyl mercury in fish are generally about a million times the methyl mercury concentration in the water (EPA 2006b). The primary way humans are exposed is by eating fish containing methyl mercury (EPA 2006b).

Other animals that consume fish and shellfish can also be adversely affected. Birds and mammals that eat fish may be more exposed to mercury than other animals in water ecosystems (EPA 2008d). Exposure to high levels of methyl mercury may include death, reduced reproduction, slower growth and development, and abnormal behavior (EPA 2008d). Research has shown that most people's fish consumption does not cause a health concern, but high levels of methyl mercury in the bloodstream of unborn babies and young children may harm the developing nervous systems of those children (EPA 2006b).

The DOE's Office of Fossil Energy has been sponsoring studies on mercury emissions from coal-based power generators to identify effective and economical control options for the past decade (U.S. Department of Energy 2006). The Office of Fossil Energy manages the largest funded program for developing an understanding of mercury emissions and developing emission control technologies for the coal-fired electric generating industry in the United States (U.S. Department of Energy 2006). Research on advanced and improved mercury control technology is ongoing (U.S. Department of Energy 2006).

In the United States, coal-burning power plants are the largest human-caused source of mercury emissions being released into the air, accounting for about 40% of all domestic human-caused

mercury emissions (EPA 2008d). However, these emissions contribute little to the global mercury pool. The EPA estimated that mercury emissions from U.S. coal-fired power plants account for about 1% of the global total (EPA 2009f).

Coal production from the Wyoming PRB represented approximately 42% of the coal used for power generation in 2006, or about 0.4% of the global anthropogenic mercury emissions. The Buckskin Mine produced about 5.2% of the coal produced in the Wyoming PRB in 2006, which would represent about 0.005% of the global mercury emissions. Under the No Action Alternatives, mercury emissions attributable to burning coal produced by the Buckskin Mine would be extended at current levels up to approximately 14 years, while the mine recovers the remaining estimated 344.3 million tons of currently leased coal reserves. Under the Proposed Action or Alternative 2, the Buckskin Mine's contribution to global mercury emissions would be extended from two to six additional years, respectively. Uncertainties about future regulatory requirements and the use of the coal mined under either of the action alternatives make it difficult to project the impacts of mercury emissions produced by burning the coal.

Additionally, burning coal in electric utility boilers generates residual materials called coal combustion residues. These residues include non-combustible materials left in the furnaces and ash that is carried up the smokestacks and collected by air pollution control technologies. As previously referenced, coal and coal combustion residues can contain a variety of compounds, metals, and other elements depending on the coal deposit and the site-specific characteristics of where the coal originated. Coal-fired boilers are required to have control devices to reduce the amount of emissions that are released into the atmosphere (EPA 2007e). The use of air pollution control equipment at power plants has resulted in fewer emissions but has also increased the amount of solid residues.

In the past, coal combustion residues have been recycled or disposed of in landfills or surface impoundments. More recently, these residues have been disposed of in mines as part of the reclamation process. There can potentially be risks of contamination of drinking water supplies and surface water bodies by coal combustion residues, particularly when they are disposed of in mines (National Academy of Science 2006; EPA 2002c). Buckskin Mine does not dispose of combustion residues. The EPA is evaluating management options for solid wastes from coal combustion, including whether current management practices pose risks to human health or ecological receptors.

As stated, the Buckskin Mine produced about 5.2% of the coal produced in the Wyoming PRB in 2006. Under the No Action Alternative, production of coal combustion residue attributed to burning coal from the Buckskin Mine would be extended at about current levels for approximately 14 years, while the mine recovers the remaining estimated 344.3 million tons of currently leased coal reserves. Coal combustion residue related to burning coal mined under the Proposed Action or Alternative 2 would be extended from two to six additional years, respectively. Uncertainties about future regulatory requirements and the use of the coal mined under either action alternative make it difficult to project the impacts of disposing of the related coal combustion residues.

Depending on the size, shape, and chemical composition, some coal combustion residues can be recycled and beneficially reused as components of building materials or as replacement to raw materials that would ordinarily need to be mined (e.g., sand, gravel, or gypsum) (EPA 2007e).

Coal combustion products (CCPs) are produced primarily from the combustion of coal in coal-fired power plants (EPA 2007e) and can include the following materials: fly ash, bottom ash, boiler slag, and flue gas desulfurization material (EPA 2007e). Studies and research conducted or supported by the EPA, EPRI, other government agencies, and universities have indicated that the beneficial uses of CCPs have not been shown to present significant risks to human health or the environment (EPA 2009g).

Fly ash is a by-product of burning finely ground coal in a boiler to produce electricity. Physically, fly ash is a fine, powdery material composed mostly of silica and nearly all particles are round. Fly ash is a siliceous material that, in the presence of water, reacts with calcium hydroxide at ordinary temperatures to produce cement-like compounds. Because of its shape and properties, fly ash can be useful in cement and concrete applications. (EPA 2007h.)

Bottom ash is agglomerated ash particles, formed in furnaces burning pulverized coal that are too large to be carried in the flue gases. Bottom ash is coarse with grain sizes from fine sand to fine gravel. It can be used as a replacement for aggregate and is usually sufficiently well-graded in size to avoid the need for blending with other fine aggregates. (EPA 2007g.)

Boiler slag is the molten bottom ash collected at the base of slag tap and cyclone type furnaces. Boiler slag particles are uniform in size, hard, and durable with a resistance to surface wear. The permanent black color of this material is desirable for asphalt applications and aids in melting snow. (EPA 2007h.)

Flue gas desulfurization material is a product of a process typically used for reducing SO_2 emissions from the exhaust gas system of a coal-fired boiler. These materials can be used as embankment and road base material, wallboard manufacturing, and in place of gypsum to produce cement. Currently, the largest single market for flue gas desulfurization material is in wallboard manufacturing. (EPA 2007i.)

Using CCPs can generate significant environmental and economic benefits (EPA 2009f). CCPs can be used for raw feed for cement clinker, concrete, grout, flowable fill, structural fill, road base/sub-base, soil modification, mineral filler, snow and ice traction control, blasting grit and abrasives, roofing granules, mining applications, wallboard, waste stabilization/solidification, and soil amendment (EPA 2009f).

Using CCPs can reduce energy consumption and GHG emissions and can help reduce the need for landfill space. Economic benefits include reduced costs associated with managing coal ash and slag disposal, potential revenue from the sale of CCPs, and savings from using CCPs in place of other more costly raw materials (EPA 2009f).

CCPs offer product-performance benefits as well. Boiler slag is a sought-after replacement for sand in blasting grit because it is free of silica and eliminates the potential health risk of silicosis (EPA 2009g). High coal ash content concrete is used for building pavements designed to last 50 years—twice the lifetime of conventional pavements. Coal fly ash can create superior products because of its self-cementing properties (EPA 2007f). Using coal fly ash in concrete can also produce stronger and longer-lasting buildings (EPA 2007f). This not only reduces the costs of maintaining buildings, but also provides the additional environmental benefit of reducing the need for new concrete to repair or replace aging buildings. This translates to a significant reduction in future energy consumption and GHG emissions (EPA 2007f).

In 2005, demand had become so strong for coal ash that some power plants were selling all the ash they produced (EPA 2005d). The EPA estimated that by using 15 million tons of coal fly ash, the United States reduced its GHG emissions equivalent to the annual emissions of nearly 2.5 million passenger vehicles (EPA 2008e).

Because of the many potential uses of CCPs, the EPA has sponsored the Coal Combustion Products Partnership (C2P2) Program to further the beneficial use of these coal combustion by-products (EPA 2003b). With more than 170 private and public partners (EPA 2009c), the C2P2 Program is a cooperative effort between the EPA and various organizations to promote the beneficial use of CCPs and the environmental benefits which can result from the proper use of these potentially recyclable materials (EPA 2003b). The C2P2 program will help meet the national waste reduction goals of the Resource Conservation Challenge—an EPA effort to find flexible yet more protective ways to conserve valuable natural resources through waste reduction, energy recovery, and recycling (EPA 2009c).

In 2007, the United States used approximately 43% of its CCPs (EPA 2009c). The C2P2 program aims to reduce adverse effects on air and land by increasing the use of CCPs to 50% in 2011 from 32% in 2001 (EPA 2009d). The program also plans to increase the use of CCPs as a supplementary cement-like material in concrete by 50%, from 12.4 million tons in 2001 to 18.6 million tons in 2011 (EPA 2009d). This would decrease GHG emissions by avoiding cement manufacturing of approximately 5 million tons of cement (EPA 2009d).

Table 4-41 summarizes the magnitude and duration of cumulative impacts in the PRB based on the upper and lower estimates for coal production in the region. The Proposed Action and Alternative 2 are within the upper and lower coal production estimates used to project reasonably foreseeable impacts for the PRB Coal Review and to provide a basis for quantification of related impact-causing parameters. As described in section 4.0, the PRB Coal Review is not an analysis of the impacts associated with the development of a specific project in the PRB, such as the Hay Creek II coal lease application discussed in this EIS.

Table 4-41. Summary Comparison of Magnitude and Duration of Cumulative Impacts[a,b]

Description of Potential Impact by Resource	Magnitude, Type, and Duration of Impact	
Resource Name	**Alternative 1 (No Action)**	**Proposed Action, Alternative 2**
Topography and Physiography		
Alteration of topography following reclamation of coal disturbance areas	Permanent topographic moderation following reclamation	Same as Alternative 1
Alteration of topography to accommodate coal-related, oil and gas, and oil- and gas-related facilities	Long-term to permanent limited changes in discrete, scattered areas	Same as Alternative 1
Geology and Mineral Resources		
Recovery of coal resulting in reduction in coal resources and disturbance and replacement of overburden and topsoil	Moderate, permanent	Same as Alternative 1
Surficial disturbance and reclamation on oil and gas well sites and associated facilities	Moderate, long-term	Same as Alternative 1
Paleontology		
Coal, coal-related, oil and gas, and oil- and gas-related development disturbance of PFYC Class 5 Wasatch and Class 3 Fort Union formations	Permanent potential adverse effects to scientifically significant fossils that are present but not visible prior to disturbance	Same as Alternative 1
Air Quality		
Impacts to Wyoming near-Field Receptors 24-hour PM_{10} and $PM_{2.5}$	Maximum modeled impacts occurring at isolated receptors show localized exceedances of the WAAQS and NAAQS for the base year (2004) as well as for both coal production scenarios for 2015 and 2020	Same as Alternative 1
Annual PM_{10}	Maximum modeled impacts at peak receptors show 20% increase from base year (2004); exceed the WAAQS for both coal production scenarios for 2015 but in compliance with WAAQS for both coal production scenarios for 2020	Same as Alternative 1
Annual $PM_{2.5}$	Maximum modeled impacts at peak receptors show 20% increase from base year (2004) and localized exceedances of the WAAQS and NAAQS for both coal production scenarios for 2015 and 2020	Same as Alternative 1

Table 4-41. Continued

Description of Potential Impact by Resource	Magnitude, Type, and Duration of Impact	
Resource Name	**Alternative 1 (No Action)**	**Proposed Action, Alternative 2**
All other parameters	Modeled impacts in compliance with WAAQS and NAAQS for both coal production scenarios for 2015 and 2020	Same as Alternative 1
Impacts to Montana near-Field Receptors All parameters	Impacts at all Montana receptors would be in compliance with NAAQS and Montana AAQS (MAAQS) for most pollutants and averaging periods. 1-hour NO_2 concentrations for all years and development scenarios were predicted to exceed NAAQS. 1-hour NO_2 concentrations were predicted to exceed MAAQS in 2015 at isolated locations because of CBNG development in Wyoming but drop below MAAQS by 2020. Impacts are predicted to decrease for annual NO_2, PM_{10} and $PM_{2.5}$ relative to the base year (2004) because of anticipated southward progression of nearby CBNG wells	Same as Alternative 1
Non-regulatory PSD Impacts at Class I and Sensitive Class II Areas Class I Northern Cheyenne Indian Reservation	Modeled impacts above Class I increment levels for 24-hour PM_{10} for all years and coal production scenarios; for 24-hour SO_2 for both coal production scenarios for 2020; for 3-hour SO_2 for upper coal production scenario for 2020	Same as Alternative 1
Class I Badlands National Park	Modeled impacts above Class I increment levels for 24-hour PM_{10} for both coal production scenarios for 2020	Same as Alternative 1
Class I Wind Cave National Park	Modeled impacts above Class I increment levels for 24-hour PM_{10} for all years and coal production scenarios	Same as Alternative 1
All Sensitive Class II Areas (including Cloud Peak Wilderness Area and Crow Indian Reservation)	Modeled impacts below Class II increments for all Sensitive Class II areas for base year (2004) and both coal production scenarios for 2020	Same as Alternative 1
Visibility Impacts Class I Areas	Modeled impacts show 200 or more days a year during the base year (2004) with a change of 1.0 dv or greater at the Northern Cheyenne Indian Reservation, Badlands National Park, and Wild Cave National Park.; the same three Class I areas have the highest predicted visibility change in 2020	Same as Alternative 1
Sensitive Class II Areas	All but four areas have more than 100 days a year during the base year (2004) with a change of 1.0 dv or greater	Same as Alternative 1
Acid Deposition Impacts	All modeled impacts below the deposition threshold values for nitrogen and sulfur compounds	Same as Alternative 1

Table 4-41. Continued

Description of Potential Impact by Resource	Magnitude, Type, and Duration of Impact	
Resource Name	**Alternative 1 (No Action)**	**Proposed Action, Alternative 2**
Florence Lake	Modeled impact above 10% ANC threshold for both coal production scenarios for 2015 and 2020	Same as Alternative 1
Upper Frozen Lake	Modeled impact above 1 µeq/L ANC for both coal production scenarios for 2015 and 2020	Same as Alternative 1
All other modeled sensitive lakes	Modeled impact below 10% ANC threshold values for both coal production scenarios for 2015 and 2020	Same as Alternative 1
Groundwater Resources		
Removal of coal aquifer and replacement with backfill material	Moderate, long-term to permanent for mining areas	Same as Alternative 1
Lowering of water levels in aquifers around the mines	Moderate, long-term in area immediately west of mines	Same as Alternative 1
Water level decline in sub-coal aquifers as a result of all development	No cumulative impacts anticipated	Same as Alternative 1
Change in groundwater quality as a result of all development	No cumulative impacts anticipated	Same as Alternative 1
Overlapping drawdown in the coal aquifer caused by surface mining and CBNG development	Additive, long-term in area immediately west of surface coal mines	Same as Alternative 1
Surface Water Resources		
Surface disturbance of intermittent and ephemeral streams and scattered ponds and reservoirs as a result of coal mining, coal-related, oil and gas, and oil- and gas-related development	Moderate, short-term	Same as Alternative 1
Discharge of coal mining and CBNG produced waters into intermittent and ephemeral streams	Moderate, short-term	Same as Alternative 1
Sediment input into intermittent and ephemeral streams and scattered ponds and reservoirs as a result of coal mining, coal-related, oil and gas, and oil- and gas-related development	Moderate, short term	Same as Alternative 1
Alluvial Valley Floors		
Coal mining disturbance of AVFs determined to be significant to agriculture	Not permitted by regulation	Same as Alternative 1
Coal mining disturbance of AVFs determined not to be significant to agriculture	AVFs disturbed by mining must be restored to essential hydrologic function; no cumulative impacts anticipated	Same as Alternative 1

Table 4-41. Continued

Description of Potential Impact by Resource	Magnitude, Type, and Duration of Impact	
Resource Name	**Alternative 1 (No Action)**	**Proposed Action, Alternative 2**
Soils		
Coal mining, coal-related, oil and gas, and oil- and gas-related disturbance and replacement of soil resources	Moderate, short-term and long-term impacts through accelerated wind or water erosion, declining soil quality factors through compaction, reduced microbial populations and organic matter, and potential mixing of soil zones	Same as Alternative 1
CBNG water disposal impacts to soil resources	Potential increase in soil alkalinity depending on SAR levels in water and method of water disposal	Same as Alternative 1
Wetland and Riparian Vegetation		
Removal of jurisdictional wetlands and loss of wetland function until reclamation occurs	Moderate, short-term; no net loss	Same as Alternative 1
CBNG-related discharge of produced water	Moderate, short- to long-term creation of wetlands in areas that previously supported upland vegetation	Same as Alternative 1
Vegetation		
Coal mining, coal-related, oil and gas, and oil- and gas-related removal and replacement of native vegetation	Moderate, short- to long-term impacts because of potential differences in species composition and presence and size of woody species on reclaimed lands	Same as Alternative 1
Coal mining, coal-related, oil and gas, and oil- and gas-related impacts to Special Status Plant Species	Potential incremental loss or alteration of potential or known habitat	Same as Alternative 1
Coal mining, coal related, oil and gas, and oil- and gas-related dispersal of noxious and invasive species	Potential displacement of native species and changes in species composition	Same as Alternative 1
Wildlife and Fisheries		
Direct and indirect coal mining, coal-related, oil and gas, and oil- and gas-related development impacts to game and non-game species, including direct mortality, habitat fragmentation, animal displacement, noise and increased human presence	Moderate, short-term	Same as Alternative 1
Coal mining, coal-related, oil and gas, and oil- and gas-related disturbance of game and nongame species habitat during project development and operation	Moderate, short-term loss of all types of habitat present in disturbed areas	Same as Alternative 1

Table 4-41. Continued

Description of Potential Impact by Resource	Magnitude, Type, and Duration of Impact	
Resource Name	**Alternative 1 (No Action)**	**Proposed Action, Alternative 2**
Coal mining, coal related, oil and gas, and oil- and gas-related habitat changes after reclamation	Moderate, long-term change in habitat with potential changes in associated wildlife populations	Same as Alternative 1
Alteration or loss of habitat because of coal mining, coal-related, oil and gas, and oil- and gas-related development	Negligible to moderate, short- to long-term	Same as Alternative 1
Changes in water quality as a result of surface disturbance or introduction of contaminants into drainages caused by coal mining, coal-related, oil and gas, and oil- and gas-related development	Minor to moderate, short- to long-term	Same as Alternative 1
Changes in available habitat as a result of water withdrawals or discharges related to coal mining, coal-related, oil and gas, and oil- and gas-related development	Moderate, short-term	Same as Alternative 1
Special Status Species		
Direct and indirect coal mining, coal-related, oil and gas, and oil- and gas-related development impacts, including direct mortality, breeding area, nest or burrow abandonment, sage-grouse lek abandonment, noise and increased human presence	No effect on threatened or endangered species; moderate, short- to long-term effects on candidate vertebrate species	Same as Alternative 1
Coal mining, coal-related, oil and gas, and oil- and gas-related disturbance of habitat (breading and nesting) during project development and operation	No effect to moderate, short- to long-term loss of all types of special status species habitat present in disturbed areas	Same as Alternative 1
Coal mining, coal related, oil and gas, and oil- and gas-related habitat changes after reclamation	No effect to moderate, short- to long-term change in habitat with potential changes in associated populations of special status species	Same as Alternative 1
Land Use and Recreation		
Loss of forage and range improvements and restriction of livestock movement because of coal mining, coal-related, oil and gas, and oil- and gas-related development	Moderate, short-term	Same as Alternative 1
Disturbance of developed recreation sites by coal mining, coal-related, oil and gas, and oil- and gas-related development	Negligible, short-term	No additional impacts, private surface

Table 4-41. Continued

Description of Potential Impact by Resource	Magnitude, Type, and Duration of Impact	
Resource Name	**Alternative 1 (No Action)**	**Proposed Action, Alternative 2**
Reduction or degradation of opportunities for dispersed recreation activities related to coal mining, coal-related, oil and gas, and oil- and gas-related development	Moderate, short-term on existing mine areas	No additional impacts, private surface
Cultural Resources and Native American Concerns		
Disturbance of cultural resource sites	Ineligible sites could be destroyed without protection or further work; no impact on known sites; impacts on eligible sites discovered during operations would be avoided or mitigated through data recovery prior to mining; no impact on known unevaluated sites; impacts on unevaluated sites are not permitted; unevaluated sites would be evaluated prior to mining	Same as Alternative 1
Transportation and Utilities		
Movement of segments of existing public roads, pipelines, transmission lines, or railroads to accommodate coal mining development	Moderate, long-term to permanent, disruptive effects would be minimized	Same as Alternative 1
Increased vehicular traffic on roads and highways because of coal mining, coal-related, oil and gas, and oil- and gas-related development, and associated impacts including traffic accidents, road wear, air emissions, dust, noise, and vehicle collisions with wildlife and livestock	Moderate, short-term	Same as Alternative 1
Construction and operation of additional railroad and pipeline facilities and transmission lines to transport coal, oil and gas, and electricity	Moderate, short- to long-term	Same as Alternative 1
Socioeconomics		
Increases in employment related to coal mining, coal-related, oil and gas, and oil- and gas-related development	Significant, short- to long-term	Negligible added with Hay Creek II LBA
Increases in personal income because of employment increases related to coal mining, coal-related, oil and gas, and oil- and gas-related development	Significant, beneficial, short- to long-term	Negligible added with Hay Creek II LBA
Increase in population because of employment increases related to coal mining, coal-related, oil and gas, and oil- and gas-related development	Significant, short- to long-term	Negligible added with Hay Creek II LBA

Table 4-41. Continued

Description of Potential Impact by Resource	Magnitude, Type, and Duration of Impact	
Resource Name	**Alternative 1 (No Action)**	**Proposed Action, Alternative 2**
Expansion of housing supply because of employment increases related to coal mining, coal-related, oil and gas, and oil- and gas-related development	Significant, short- to long-term	Negligible added with Hay Creek II LBA
Increases in school enrollment because of employment increases related to coal mining, coal-related, oil and gas, and oil- and gas-related development	Moderate, short-term	Negligible to minor added with Hay Creek II LBA
Need for additional local government facilities and services because of employment increases related to coal mining, coal-related, oil and gas, and oil- and gas-related development	Moderate, short- to long-term	No impacts added with Hay Creek II LBA
Increased federal, state, and local revenues related to coal mining, coal-related, oil and gas, and oil-and gas-related development	Significant, beneficial, short- to long-term	Same as Alternative 1

[a] Cumulative impacts discussion and table are based on the PRB Coal Review analyses (BLM 2005a–f, 2006c–e, 2008a, 2009c–g). The Proposed Action and alternatives fall within those impact projections.

[b] All impacts are assumed to be adverse unless noted otherwise.

5.0 CONSULTATION AND COORDINATION

As part of the EIS process, the BLM notifies the general public when the draft and final documents, and the ROD, are available for review and comment. In addition to accepting public comments, the BLM consults with multiple state and federal agencies and entities regarding impacts on various resources. This collective input plays a major role in the BLM's decision on proposed lease applications. The public notification and consultation processes are described below.

5.1. Regional Coal Team Consultation

The Hay Creek II LBA included in this EIS was reviewed and discussed at a PRRCT public meeting held on April 19, 2006, in Casper, Wyoming. The applicant presented information about the existing mine and lease application at that meeting. Voting and nonvoting members of the PRRCT include the governors of Wyoming and Montana; Northern Cheyenne Tribe and Crow Tribal Council; USDA Forest Service and USFWS; and National Park Service, OSM, and USGS. The PRRCT determined that the land in the Hay Creek II LBA met the qualifications for processing as a production maintenance tract and recommended that the BLM continue to process the coal lease application.

5.2. Governor's Consultation

On September 18, 2006, the BLM Wyoming State Director notified the Governor of Wyoming that the Buckskin Mine had filed a coal lease application with the BLM for the Hay Creek II tract.

5.3. Public Notice

The BLM published a notice of intent to prepare an EIS and notice of scoping in the *Federal Register*, the *Gillette News-Record*, and a BLM news release on January 17, 2008. The publication served as public notice that the Hay Creek II coal lease application had been received, announced the time and location of a public scoping meeting, and requested public comment on the LBA.

Parties on the distribution list were sent letters announcing the time and location of a public scoping meeting on January 31, 2008, in Gillette, Wyoming. At the public meeting, the applicant presented information about their mine and their need for the coal. The presentation was followed by a question and answer period, during which no oral comments were made. The scoping period was extended from December 21, 2007, through March 29, 2008, during which time the BLM received written, e-mailed, and telephoned comments from interested individuals and entities.

The EPA published a notice in the *Federal Register* on March 12, 2010, announcing the availability of the draft EIS. A 60-day comment period on the draft EIS commenced with publication of that notice. The BLM also published a notice of availability/notice of public hearing in the *Federal Register* on March 12, 1010. That notice announced the date and time of a public hearing to be held during the 60-day comment period. The purpose of the hearing, held in Gillette, Wyoming on April 22, 2010, was to solicit public comments on the draft EIS and on the fair market value, the maximum economic recovery, and the proposed competitive sale of federal coal from the proposed tract. The BLM also published a notice of public hearing in the *Gillette News-Record* and other local newspapers.

All substantive written comments received on the draft EIS have been included, with corresponding responses from the BLM, in appendix D of this final EIS. Both the BLM and the EPA will publish a notice of availability of the final EIS in the *Federal Register*, and all parties on the distribution list will be sent copies of that document immediately following the publication date. After a 30-day availability period, the BLM will make a decision to hold or not to hold a competitive lease sale for the federal coal in the LBA tract and a ROD will be signed. Copies of the ROD will be sent to all parties on the mailing list and others who commented on this LBA during the NEPA process. An appeal of the BLM's decision must be filed within 30 days from the date that the notice of availability for the ROD is published in the *Federal Register*. The decision can be implemented at the end of the 30-day appeal period, if no appeal is received. If a competitive lease sale is held, it will follow the procedures set forth in 43 CFR 3422, 43 CFR 3425, and BLM Handbook H 3420 1 (Competitive Coal Leasing).

5.4. Department of Justice Consultation

After a competitive coal lease sale, but before the lease is issued, the BLM must solicit the opinion of the U.S. Department of Justice on whether the planned lease issuance creates a situation inconsistent with federal antitrust laws. The Department of Justice has 30 days to make this determination. If the Department of Justice has not responded in writing within the 30 days, the BLM can issue the lease.

5.5. Other Consultations

Other federal, state, local, and Native American government agencies that were consulted in preparation of this EIS or will be consulted prior to making a decision to hold or not hold a federal coal lease sale are listed in Table 5-1.

Table 5-1. Federal, State, and Local Government Agencies Consulted in Preparation of the Environmental Impact Statement

Name	Project Responsibility
NATIONAL OCEANIC AND ATMOSPHERIC ASSOCIATION	
Pieter Tans	Earth System Research Laboratory Global Monitoring Division Carbon Cycle and Greenhouse Gases Senior Scientist
UNIVERSITY OF WYOMING	
Bonnie Heidel	Wyoming Natural Diversity Database Botanist
Ron Hartman	Rocky Mountain Herbarium Curator
B. Ernie Nelson	Rocky Mountain Herbarium Manager
BLM NATIONAL SCIENCE AND TECHNOLOGY CENTER (POWDER RIVER BASIN COAL REVIEW)	
Craig Nicholls	Air Quality and Climate
Paul Summers	Water Resources
ENSR INTERNATIONAL (NOW AECOM) (POWDER RIVER BASIN COAL REVIEW)	
Valerie Randall	Project Manager
Dolora Koontz	Assistant Project Manager and Task 2 Manager (Existing Development and Reasonably Foreseeable Development)
Eldon Strid, Matt Reilly	Existing and Projected Coal Development and Coal Transportation Scenarios
Doree Dufresne	Database Development
Bruce MacDonald, PhD	Air Quality
Robert Berry, PhD	Water Resources
James Rumbaugh	Groundwater Modeling
Brad Anderson	Surface Water
Ron Dutton, George Blankenship	Socioeconomics
Bernhard Strom	Land Use, Transportation, and Utilities
William Berg	Topography, Geology, and Minerals
James Burrell, James Nyenhuis	Soils and Alluvial Valley Floors
Jon Alstad	Vegetation, Wetlands, and Grazing
Charles Johnson	Wildlife
Rollin Daggett	Fisheries
Kim Munson	Native American Concerns and Paleontological Resources

5.6. List of Contributors, Reviewers, and Preparers

This EIS was prepared by ICF International, a third-party contractor, under the direction of the BLM. Representatives from cooperating agencies reviewed and contributed to the EIS. Tables 5-2 and 5-3 provide listings of the BLM, OSM, and WDEQ interdisciplinary team and the third-party consultant personnel who contributed to, reviewed, and prepared this EIS.

Table 5-2. List of Contributors and Reviewers

Name	Project Responsibility
BLM Wyoming State Office	
Brenda Neuman	Coal Program Coordination
Bob Janssen	Coal Program Coordination
Janet Kurman	NEPA Coordination
Mavis Love	Land Adjudication
Larry Jensen	Socioeconomics
Dale Hansen	Paleontology
Brent Breithaupt	Paleontology
Steve Hageman	Minerals Appraiser
Susan Caplan	Air Quality and Climate Change
John Zachariassen	Air Quality and Climate Change
Melissa Hovey	Air Quality and Greenhouse Gas
Robert Means	Greenhouse Gas and Climate Change
Rick Schuler	Water Resources
Julie Weaver	Land Adjudication
BLM Wyoming State Office Reservoir Management Group	
Dwain McGarry	CBNG Geology
Lee Almasy	CBNG Reservoir Engineering
Karl Osvald	Senior Geologist
BLM Buffalo Field Office	
Buck Damone	Cultural Resources
Leigh Grench	Cultural Resources
Clint Cargo	Cultural Resources
B.J. Earle	Cultural Resources
Patrick Cole	Wildlife, T&E Species, BLM Sensitive Species
Don Brewer	Wildlife
Gerald Queen	Geology, Minerals, Mining Claims
Office of Surface Mining Reclamation and Enforcement Western Regional Coordinating Center	
Foster Kirby	Archaeologist, EIS Cooperating Agency Representative
Heather Erickson	EIS Project Coordinator
Wyoming State Planning Office	
Steve Furtney	Coal Issues Coordination, Cooperating Agency Representative
Wyoming Department of Environmental Quality	
Dan Clark	Ombudsman, EIS Liason

Table 5-2. Continued

Name Projec	t Responsibility
LAND QUALITY DIVISION	
Don McKenzie	Administrator
Kathy Muller Ogle	CHIA Program Supervisor
Doug Emme	Blasting Program Principal
Mark Rogaczewski	District III Supervisor
AIR QUALITY DIVISION	
Kelly Bott	Engineer, EIS Cooperating Agency Division Representative
Paige Smith	Planning Section Manager
WATER QUALITY DIVISION	
John Wagmer	Water Resources
WYOMING DEPARTMENT OF TRANSPORTATION	
Larry Konetzki	EIS Cooperating Agency Representative
WYOMING GAME AND FISH DEPARTMENT	
John Emmerich	Deputy Director – External Programs

Table 5-3. List of Preparers

Name	Education/Experience	Responsibility
BLM CASPER FIELD OFFICE		
Teresa Johnson	M.S. course work in Ecosystem Management, B.S. Earth Systems Ecology, Native American Cultural Emphasis Phase, 11 years professional experience	EIS Project Manager
Mike Karbs	M.S., B.S. Mineral Engineer, Public Policy, 34 years professional experience	Assistant District Manager Solid Mineral
Sarah Bucklin	M.S. Zoology, B.S. Biology, Nationally Certified Wildlife Biologist, 11 years professional experience	Wildlife, T&E Species – Environmental Protection Specialist
Ginger Vickers	B.A. Resource Management, 3 years of professional experience	Public Involvement, Distribution List – Legal Assistant
ICF INTERNATIONAL (THIRD-PARTY CONTRACTOR)		
Gwyn McKee	M.S. Wildlife Management/Ecology, B.S. Wildlife Management, 21 years professional experience	EIS Project Manager,Wildlife, T&E Species,Report Preparation, Document Review
Kim Stevens	B.S. Geography, 8 years professional experience	Project Coordinator, Report Preparation
Bryan Morse	B.S. Urban Planning, 5 years professional experience	Project Assistant, Report Preparation
Jim Wilder	M.S. Environmental Engineering, B.S. Civil Engineering, 32 years professional experience	Noise Assessment, Report Preparation

Table 5-3. Continued

Name	Education/Experience	Responsibility
Rose Difley	M.S., B.S. Geology, 6 years professional experience	Paleontology Survey, Report Preparation
Deborah Bartley	B.A. Political Science, U.D. International Relations, 11 years professional experience	Lead Editor
Brent Bouldin	M.A. Communications, B.S. Communications, 32 years professional experience	Technical Editor, Document Production
Corrine Ortega	A.A. Communications, 20 years professional experience	Document Production
Kate Walsh	B.A. History, B.A. Photography, 9 years professional experience	Document Production
Bobby Tuttle	M.S. Biology, B.S. Planning, 18 years professional experience	Wetlands Survey, Project Director
SUBCONTRACTORS FOR ICF INTERNATIONAL		
Ron Dutton Sammons/Dutton LLC	M.S. Economics, B.S. Economics, 33 years professional experience	Socioeconomic Evaluation
Brenda Schladweiler	Ph.D. , M.S. Soil Science, B.S. Range Mgt (Land Rehabilitation), 31 years professional experience	Soil Survey, Report Preparation
Jamie Eberly BKS Environmental Associates, Inc.	B.S. Range Management, 6 years professional experience	Report Preparation
Gregory S. Newberry Antiquus Cultural Resource Consulting	M.A. Anthropology, B.A. Anthropology, 31 years professional experience	Cultural Resource Survey, Report Preparation
SUBCONTRACTORS FOR BUCKSKIN MINE		
Julie Gerlach Steve Stresky Robert Tilden Aqua Terra Consultants, Inc.	Manager Lands & Permitting, 32 years professional experience Geologist, 31 years professional experience Geologist, 6 years professional experience	Land Use Assessment, Water Resources Analysis, Geology and Minerals Evaluation, Alluvial Valley Floor Assessment, Report Preparation
Richard Bonine, Jr. Habitat Management, Inc.	B.S. Agronomy, 23 years professional experience	Vegetation Survey, T&E Vegetation Survey, Report Preparation
Richard Bonine, Jr. LandTrak Resources, Inc.	B.S. Agronomy, 23 years professional experience	Vegetation Survey, T&E Vegetation Survey, Report Preparation
Ronn Smith Inter-mountain Laboratories, Inc.	MBA, B.S. Engineering Physics, 32 years professional experience	Air Quality Assessment, Report Preparation

5.7. Distribution List

This EIS was distributed to Congressional offices, federal agencies, state governments, local governments, Native American government agencies, industry representatives, interest groups, and individuals for their review and comment (Table 5-4).

Table 5-4. General BLM Information Distribution List for Coal Leasing

Federal and State Officials	
Governor of Montana - Honorable Brian Schweitzer	Senator John Hines
Governor of Wyoming - Honorable Matt Mead	Senator Michael Von Flatern
Representative Gregg Blikre	US Senator John Barrasso
Representative Norine Kasperik	US Senator Mike Enzi
Representative Thomas Lubnau	US Congresswoman Cynthia M. Lummis
Representative Sue Wallis	
Federal Agencies	
BLM - Wyoming State Office, Cheyenne, Wyoming	OEPC - Denver, CO
BLM - Montana State Office, Billings, MT	OSM - Casper, WY
BLM - Buffalo, WY	OSM - Denver, CO
BLM - Casper, WY	OSM - Washington, DC
BLM - Miles City, MT	OSM Library - Denver, CO
BLM - Washington, DC	Rocky Mountain Region Solicitor
BLM Library - Denver, CO	US Army Corps of Engineers - Cheyenne, WY
Bureau of Indian Affairs - Washington, DC	US EPA - Washington, DC
National Park Service - Washington, DC	US EPA Region VIII - Denver, CO
Department of Natural Resources & Conservation - Helena, MT	US Fish & Wildlife Service - Arlington, VA
Department of Energy - Casper, WY	US Fish & Wildlife Service - Cheyenne, WY
Department of Energy – Washington, DC	US Fish & Wildlife Service - Buffalo, WY
Department of the Interior - Denver, CO	US Geological Survey - Cheyenne, WY
DOI Natural Resource Library - Washington, DC	US Geological Survey - Denver, CO
MMS - Denver, CO	US Geological Survey - Reston, VA
MMS - Helena, MT	US Government Printing Office - Washington, DC
MMS - Herndon, VA	USDA Forest Service - Golden, CO
MMS Solid Min/Geothermal CAM - Denver, CO	USDA Forest Service - Douglas Ranger District, Douglas, WY
National Park Service - Denver, CO	USGS Water Resources Division - Cheyenne, WY
State Agencies	
Department of Transportation	Game & Fish Department - Lander, WY
Office of State Lands & Investments	Game & Fish Department - Sheridan, WY
Office of the State Treasurer	Oil and Gas Conservation Commission
WDEQ - Air Quality Division - Cheyenne, WY	Parks and Cultural Resources Department
WDEQ - Land Quality Division - Sheridan, WY	Public Service Commission

Table 5-4. Continued

WDEQ - Water Quality Division - Cheyenne, WY	State Engineer's Office
WDEQ Land Quality Division - Cheyenne, WY	State Geological Survey
Department of Agriculture	State Historic Preservation Office
Department of Education	State Planning Office
Department of Employment, Research & Planning	Water Development Commission
WDEQ - Industrial Siting Division	Economic Analysis Division
Game & Fish Department - Cheyenne, WY	
LOCAL GOVERNMENT AGENCIES	
Big Horn County Commission, MT	Converse County School District, WY
Campbell County Deptartment of Public Works, WY	Converse County Special Projects, WY
Campbell County Board of Commissioners, WY	Devils Tower National Monument, WY
Campbell County Conservation District, WY	Gillette Department of Community Development, WY
Campbell County School District 1, WY	Medicine Bow National Forest, WY
City of Douglas, WY	Rosebud County Commission, MT
City of Gillette, WY	Town of Wright, WY
Converse County Commission, WY	Weston County Board of Commissioners, WY
Converse County Joint Powers Board, WY	
TRIBAL ORGANIZATIONS AND INDIVIDUALS	
Apache Tribe of Oklahoma	Lower Brule Sioux Tribal Council
Apache Tribe of Oklahoma Tribal Chairman	Lower Brule Sioux Tribe
Arapahoe Business Council	Northern Arapaho Business Council
Cheyenne River Sioux Tribe	Northern Arapaho Tribe
Cheyenne River Sioux Tribe THPO	Northern Cheyenne Cultural Commission
Cheyenne-Arapaho Tribes of Oklahoma	Northern Cheyenne Tribe
Comanche Nation	Oglala Sioux Tribe
Comanche Nation Tribal Chairman	Oglala Sioux Tribe THPO
Comanche Tribe NAGPRA Office	Rosebud Sioux THPO
Crow Creek Sioux Tribe THPO	Rosebud Sioux Tribal Council
Crow Creek Sioux Tribe, South Dakota	Rosebud Sioux Tribe
Crow Tribe, Montana	Santee Sioux Tribe
Eastern Shoshone Tribe	Shoshone Business Council
Flandreau Santee Sioux Tribe	Standing Rock Sioux Tribe
Flandreau Santee Sioux Tribe Office of Cultural Preservation	Standing Rock Sioux Tribe THPO
Kiowa Business Committee Environmental Director	

Table 5-4. Continued

Organizations	
Advisory Council on Historic Preservation	Thunder Basin Coalition
Biodiversity Conservation Alliance	Trout Unlimited
Campbell County Economic Development Corporation	Wyoming Association of Professional Archaeologists
Center for Biological Diversity	Wyoming Bankers Association
Defenders of Wildlife	Wyoming Business Alliance
Foundation for North American Wild Sheep	Wyoming Business Council/NE Region
National Resource Defense Council	Wyoming Mining Association
National Wildlife Federation	Wyoming Outdoor Council
NWU Policy Research Institutes	Wyoming Public Service Commission
Petroleum Association of Wyoming	Wyoming Stock Growers Association
Powder River Basin Resource Council	Wyoming Wildlife Federation
Sierra Club	Wyoming Wool Growers Association
Theodore Roosevelt Conservation Partnership	
Companies/Businesses	
American Colloid Company	JIREH Exploration and Consulting LLC
All American Equipment	Kenneth R Paulsen Consultants
Alpha Coal West, Inc.	Kiewit Mining Properties Inc., Omaha
Antelope Coal, LLC	LandTrak Resources, Inc.
Ark Land Company	LE Peabody & Associates
Belle Fourche Pipeline Company	M & K Oil company Inc.
Bill Barrett Corporation	Majestic Petroleum Operations, LLC
Bitter Creek Pipelines, LLC	Marston & Marston
Bjork Lindley Little PC	McGraw-Hill
BKS Environmental Associates, Inc.	McVehil-Monnett Associates Inc.
Blackstone Energy Inc.	Meineadair Consultants
BNSF Railway Company	National Mining Association
Bridgeview Coal Co.	NM Doelger Consulting, LLC
Buckskin Mining Company	Norwest Corporation
Burns & McDonnell	NRCS
CANDO	P & M Coal
Carbon Recovery Technology	P & M Coal Mining Co
CH Snyder Company	Peabody Energy
Cloud Peak Energy Resources LLC	Peabody Powder River Mining, LLC

Table 5-4. Continued

CONSOL Inc Expl & Land Dept.	Powder River Energy Corporation
Cordero Rojo Mine	Preston Reynolds & Co., Inc., Denver
Cucker, Montgomery, Aronstein & Bess, PC	QWEST Corporation (PKA)
Devon Energy Production Co. LP	Redstone Resources Inc.
Dry Fork Coal Company Re	solute Wyoming
Ducker Montgomery et al.	Riverside Technology Inc.
Economic Analysis Division	Storm Cat Energy (Power RVR) LLC
EDE Consultants	Tetra Tech EC, Inc.
ENSR	Thunder Basin Coal Company
Environmental Solutions Inc., Beulah, WY	TRC Environmental
Environmental Solutions Inc., Sedalia, CO	Union Pacific Railroad
EOG Resources Inc.	US West Communications
Great Points Energy	Western Energy Company
Harden & Associates	Western Fuels Association
HQ-USAF/CEVP	Woodward Enterprises LLC
ICF International	WWC Engineering
Intermountain Resources	Yates Petroleum Corporation
Interwest Mining Company	Mining Associates of Wyoming
Jacobs Ranch Coal Company	
PRESS	
Associated Press	Gillette News-Record
Casper Star Tribune	Platts
Douglas Budget	Wyoming - Tribune Eagle
EDUCATIONAL INTUITIONS	
CSU Library	University of Wyoming Libraries
Northwestern University	URS Greiner Woodward Clyde Library
INDIVIDUALS	
Barbero, Ralph	McGee, Carl
Belden, Scott	McGee, John
Benson, Scott	McGee, Keith
Bierman, Sheldon	McGee, Russell
Brown, Geraldine	Miller, Faustine
Brown, Maurice	Nichols, Jeremy
Bullock, Van	Nyenhuis, Jim

Table 5-4. Continued

Carter, Wilma	Oedekoven, Byron & Marjorie
Chase, Dorothy	Persson, Irene
Chase, Russel	Phoenix (aka Phoenix), Donna Jean
Chase, William	Saulcy, Bill
Collins, Kristina	Semple, William
Couch, Marion	Turner, Dr., Jenny
Couch, Tom	Turner, Dr., Wendy
Craft, Lecia	Turner, Dan
Glustrom, Leslie	Turner, LJ
Greub, Twyla	Turner, Mike
Heisner, Bill	Ukeiley, Robert
Kass Dr., Thomas	Wanke (aka Vincent), Jeanie
Long, Robert	Ward, Linda
Maurice, Brown W.	Williams, John
McAfee, Paul	Williams, Keith
McCormick, Betty Jo & John J.	Williams, Monica
McGee Harlow, Helen Marie	Winland, Mark

Trusts	
Avis Harrod Trust	Frank Ford, Trustee
Cecle L & Laverne L. Cook Trust	Joe W. King RevocableTrust

6.0 REFERENCES CITED

6.1. Printed References

All Business. 2008. *STB Approves Canadian Pacific's Bid for DM&E Railroad, Extending U.S. Reach.* Available: <http://www.allbusiness.com/environment-natural-resources/environmental/11672161-1.html>. Accessed: February 11, 2009.

Anadarko Petroleum Corporation. 2008. *Operations: Enhanced Oil Recovery.* Available: <http://www.anadarko.com/operations_by_region/u.w._rockies/enhanced_oil_recovery.asp>. Accessed: May 2008.

Anderson Consulting Engineers (ACE). 2009. Task 3B Report Water Resources Cumulative Impact Assessment Water Quality and Channel Stability. Prepared in support of PRB Coal Review. Prepared for ENSR International. November 2009.

Argonne National Laboratory, Environmental Assessment Division. 2002. *Technical Support Document – Air Quality Impact Assessment for the Montana Statewide Oil and Gas Final Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans and the Wyoming Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project.* Argonne, IL. Prepared for the BLM, Montana and Wyoming State Offices.

Associated Press. 2007. *Market Spotlight: Coal Producers, by Samantha Bomkamp.* December 5. Available: <http://www.forbes.com>.

Avian Power Line Interaction Committee. 1994. *Mitigating Bird Collisions with Power Lines: The State of the Art in 1994.* Edison Electric Institute. Washington, D.C., 78 pp.

———. 2006. *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006.* Edison Electric Institute, Avian Power Line Interaction Committee, and the California Energy Commission. Washington, D.C., and Sacramento, CA, 207 pp.

Barry, J. 2008. *Uranium Update.* Available: <http://www.uraniumseek.com/news/UraniumSeek/ 1208186646.php>. Accessed: May 23, 2008.

Bernstein, L., P. Bosch, O. Canziani, Z. Chen, R. Christ, O. Davidson, W. Hare, S. Huq, D. Karoly, V. Kattsov, Z. Kundzewicz, J. Liu, U. Lohmann, M. Manning, T. Matsuno, B. Menne, B. Metz, M. Mirza, N. Nicholls, L. Nurse, R. Pachauri, J. Palutikof, M. Parry, D. Qin, N. Ravindranath, A. Reisinger, J. Ren, K. Riahi, C. Rosenzweig, M. Rusticucci, S. Schneider, Y. Sokona, S. Solomon, P. Stott, R. Stouffer, T. Sugiyama, R. Swart, D. Tirpak, C. Vogel, and G. Yohe. 2007. *Climate Change 2007: Synthesis Report, Summary for Policymakers.* Intergovernmental Panel on Climate Change, Fourth Assessment Report. November 17.

Bison Pipeline. 2009. *Bison Pipeline LLC.* Available: <http://www.bisonpipelinellc.com/>. Accessed: December 2009.

Bleizeffer, Dustin. 2007a. Clean-Coal Investors Plead for Regulations. *Casper Star Tribune.* October 11.

_____. 2007b. Utility Snuffs Coal Projects. *Casper Star Tribune.* December 11.

Borden G.W., R.R. Fletcher, and D.T. Taylor. 1994. *Economic Impact of Coal on Wyoming's Economy.* January. Laramie, WY: Cooperative Extension Service, Department of Agricultural Economics, College of Agriculture, B-987.

Boyles, J.M. and K. vant Veld. 2006. Preliminary CO2 Demand Analysis for the Powder River Basin. Wyoming Enhanced Oil Recovery Institute presentation to the Wyoming Pipeline Authority. January 4, 2006. Available: <http://www.wyopipeline.com/presentations.asp>. Accessed: May 2008.

Braun, C.E. 1998. Sage Grouse Declines in Western North America: What Are the Problems? Proceedings in *Western Association of State Fish and Wildlife Agencies* 78:139–156.

Breckenridge, R.M. 1974. *Campbell County Wyoming: Geologic Map Atlas and Summary of Land, Water, and Mineral Resources.* County Resource Series. Laramie, WY: Geological Survey of Wyoming.

Brown, Matthew. 2007. Federal Board OKs Final Segment of Tongue River Railroad. *Billings Gazette.* October 10. Available: <http://www.billingsgazette.net/articles/2007/10/10/news/state/17rail.txt>.

———. 2008. Coal's Future: Environmentalist Groups Threaten to Tie Up New Coal-Burning Power Plants, Even as the Nation's Demand for Energy Skyrockets. *Gillette News-Record.* January 15.

———. 2009. Montana Considers Cashing in on 1.2 Billion Tons of Coal. *Billings Gazette* (Associated Press). July 5.

Buckskin Mining Company. 2000. *Hay Creek Amended Area WDEQ-LQD Permit 500.* Appendix D-11, Alluvial Valley Floors. Housed at LQD District III Office in Sheridan, WY.

———. 2001. *Buckskin Mine Quality Assurance Project Plan.* Submitted: March 2001. Updated: April 2008.

———. 2002. *2001 Buckskin Mine Annual Report.* Submitted to Wyoming Department of Environmental Quality, Land Quality Division.

———. 2003. *2002 Buckskin Mine Annual Report.* Submitted to Wyoming Department of Environmental Quality, Land Quality Division.

———. 2004. *2003 Buckskin Mine Annual Report.* Submitted to Wyoming Department of Environmental Quality, Land Quality Division.

———. 2005. *2004 Buckskin Mine Annual Report.* Submitted to Wyoming Department of Environmental Quality, Land Quality Division.

———. 2006. *2005 Buckskin Mine Annual Report.* Submitted to Wyoming Department of Environmental Quality, Land Quality Division.

———. 2007. *2006 Buckskin Mine Annual Report.* Submitted to Wyoming Department of Environmental Quality, Land Quality Division.

———. 2008. *2007 Buckskin Mine Annual Report.* Submitted to Wyoming Department of Environmental Quality, Land Quality Division.

———. 2009a. *2008 Buckskin Mine Annual Report.* Submitted to Wyoming Department of Environmental Quality, Land Quality Division.

———. 2009b. *Air Emissions Inventory for Non-Oil and Gas Minor Sources.* Submitted to Wyoming Department of Environmental Quality/Air Quality Division on September 15, 2009.

Burlington Northern Santa Fe (BNSF). 2008. *Advisory Board.* July 9.

Campbell County. 2008a. *2007 Campbell County Annual Report.* Available: <http://ccg.co.campbell.wy.us/commissioners/forms/CC2007AnnualRpt.pdf>. Accessed: April 25, 2008.

———. 2008b. Campbell County Zoning Regulations, Section 11. *"RVP" Recreational Vehicle Park.* Available: <http://ccg.co.campbell.wy.us/commissioners/forms/Zoning%20Sec11.pdf>. Accessed: May 2008.

Center for Climate Strategies. 2007. *Wyoming Greenhouse Gas Inventory and Reference Case Projections 1990–2020.* Spring.

Cerovski, A., M. Gorges, T. Byer, K. Duffy, and D. Felley (eds.). 2001. *Wyoming Bird Conservation Plan, Version 1.0.* Wyoming Partners in Flight. Lander, WY: Wyoming Game and Fish Department.

Cerovski, A., M. Grenier, B. Oakleaf, L. Van Fleet, and S. Patla. 2004. *Atlas of Birds, Mammals, Amphibians, and Reptiles in Wyoming.* Lander, WY: Wyoming Game and Fish Department Nongame Program, 206 pp.

Chambers, J.C. 2006. *Climate Change and the Great Basin.* Prepared for the Collaborative Watershed Research and Management Conference: November 28–30, 2006. Reno, NV. Available: <http://www.cabnr.unr.edu/GreatBasinWatershed/Issues_Papers.pdf.>.

Christiansen, Tom. 2004. *Wyoming Greater Sage-Grouse Population Trend Relative to the 2005 Hunting Season – A Summary Report and Recommendation.* Available: <http://gf.state.wy.us/wildlife.wildlife_management/sagegrouse/index.asp>.

City of Gillette. 1978. *City of Gillette/Campbell County Comprehensive Planning Program.* June. Updated March 1994. Gillette, WY.

———. 2008a. *Developing Gillette, The Development Summary for January–December 2007.* Department of Community Development. Available: <http://www.ci.gillette.wy.us/about/DevelopingGillette.pdf>. Accessed: April 8, 2008.

———. 2008b. *Comprehensive Annual Financial Report for the Fiscal Year Ended June 30, 2007.* Available: <http://www.ci.gillette.wy.us/fin/FY07CAFR.pdf>. Accessed: April 25, 2008.

———. 2009. *Developing Gillette, The Development Summary for January–December 2008.* City of Gillette Planning Department. January. Available: <http://www.ci.gillette.wy.us/Modules/ShowDocument.aspx? documentid=4967>.

Clayton, K.M., J.D. Berry, P. Farmer, B. Waage, C. Yde, and J.M. Gregory. 2006. *Small Mammal Reoccupancy of Reclaimed Habitat: A Potential Indicator of Reclamation Success.* Paper presented at the 2006 Billings Land Reclamation Symposium, June 5–8, 2006, Billings, MT, and jointly published by BLRS and ASMR, Lexington, KY.

Connelly, J.W., S.T. Knick, M.A. Schroeder, and S.J. Stiver. 2004. *Conservation Assessment of Greater Sage-grouse and Sagebrush Habitats.* Western Association of Fish and Wildlife Agencies. Unpublished Report. Cheyenne, WY.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States.* Washington, D.C.: Government Printing Office.

Crist, M.A. 1991. *Evaluation of Groundwater-level Changes near Gillette, Northeastern Wyoming.* U.S. Geological Survey, Water Resources Investigations Report 88-4196.

Curtis, J. 2004. *Wyoming Climate Atlas.* Cheyenne, WY: Wyoming Water Development Commission, 328 pp.

Dakota, Minnesota & Eastern Railroad (DM&E). 2009. *PRB: Rail Upgrade Background.* Available: <http://www.dmerail.com/About_Us/PowderRiverBasin/Project-Background>. Accessed: December 2009.

De Bruin, R.H. and R.M. Lyman. 1999. Coal Bed Methane in Wyoming in Coal Bed Methane and Tertiary Geology of the Powder River Basin of Wyoming and Montana. Wyoming Geological Association 50th Field Conference Guidebook. Pp 61–72.

Delbridge, Rena. 2007. Coal Dust Concerns Converse. *Casper Star Tribune.* March 12.

Dennison, Mike. 2009. Land Board OKs Leasing Otter Creek Coal – but at a Relatively High Price. *Billings Gazette*. December 21.

Dillon, P.J., D.S. Jeffries, W. Snyder, R. Reid, N.D. Yan, D. Evans, J. Moss, and W.A. Scheider. 1978. Acid Precipitation in South-central Ontario: Recent Observations. *Journal of the Fisheries Research Board of Canada* 35:809–815.

Duke Energy. 2009. *Duke Energy to build ninth U.S. wind farm.* Last updated: August 31, 2009. Available: <http://www.duke-energy.com/news/releases/2009083101.asp>. Accessed: December 2009.

EPRI. 2009. *The Power to Reduce CO2 Emissions: The Full Portfolio—2009 Technical Report.* Last updated: October 2009. Available: <http://my.epri.com/portal/server.pt?>. Accessed: April 2010.

Estes, R. 1975. Lower Vertebrates from the Fort Union Formation, Late Paleocene, Big Horn Basin, Wyoming. *Herpetologica* 31(4):365–385.

Federal Energy Regulatory Commission. 2004. *Major Pipeline Projects on the Horizon as of February 2004.* Available: <http://www.ferc.gov/forcitizens/projectsearch/SearchProjects aspx>. Accessed: February 2004.

Federal Railroad Administration. 2008. *Freight Railroads Background.* Office of Policy and Communications. Available: <http://www.fra.dot.gov/downloads/policy/freight2006%20final.pdf>. Accessed: November 14, 2008.

Federal Transit Administration. 2006. *Transit Noise and Vibration Impact Assessment.* FTA-VA-90-1003-06. May.

Fitzgerald, J.P., C.A. Meaney, and D.M. Armstrong. 1994. *Mammals of Colorado*. Denver, CO: Denver Museum of Natural History.

Flores, R.M., A.M. Ochs, L.R. Bader, R.C. Johnson, and D. Vogler. 1999. Framework Geology of the Fort Union Coal in the Powder River Basin, Wyoming and Montana. In *Fort Union Coal Assessment Team 1999 Resource Assessment of Selected Tertiary Coalbeds and Zones in the Northern Rocky Mountains and Great Plains Region.* U.S. Geological Survey Professional Paper 1625-A, Chapter PF, pp.1–40.

Flores, R.M., G.D. Stricker, J.F. Meyer, T.E. Doll, P.H. Norton, Jr., R.J. Livingston, and M.C. Jennings. 2001. *A Field Conference on Impacts of Coalbed Methane Development in the Powder River Basin.* U.S. Geological Survey Open-File Report 01-126.

Frankel, A.C., C. Mueller, T. Barnhand, D. Perkins, E.V. Leyendecker, N. Dickman, S. Hanson, and M. Hopper. 1997. *Seismic-hazard Maps for the Coterminous United States.* Map F, Horizontal Spectral Response Acceleration for 0.2-second Period (5% of critical damping) with 10 % Probability of Exceedance in 50 Years. U.S. Geological Survey Open-File Report 97-131-F.

Frison, George. 1978. *Prehistoric Hunters of the High Plains.* New York, NY: Academic Press.

———. 1991. *Prehistoric Hunters of the High Plains.* New York, NY: Academic Press.

———. 2001. Hunting and Gathering Tradition: Northwestern and Central Plains. In Raymond J. DeMaille (ed.) *Plains*, pp. 131–145, in William C. Sturtevant (gen. ed.) *Handbook of the North American Indians*, Vol. 13, Part I. Washington, D.C.: Smithsonian Institution.

Gardiner, S. (ed.). 1985. *Rumblings from the Razor City: The Oral History of Gillette, Wyoming, an Energy Boomtown.*

Gartrell, Peter. 2007a. Railway Officials Focus on Coal Dust Solutions. *Gillette News-Record.* July 1.

———. 2007b. Will Wright Boom? *Gillette News-Record.* October 19.

———. 2008. The Quest to Harness the Wind. *Gillette News-Record.* March 29.

Greystone Environmental Consultants, Inc. 2003. *Surface Water Quality Analysis Technical Report. Surface Water Modeling of Water Quality Impacts Associated with Coalbed Methane Development in the Powder River Basin.* January.

Hansen and Lebedeff. 1987. Global Trends of Measured Surface Air Temperature, 92 J. *Geophysical Res.* 345.

Heinecke, B. 1985. *Rumblings from the Razor City: The Oral History of Gillette, Wyoming, an Energy Boomtown.* S. Gardiner (ed.).

HKM Engineering, Inc., Lord Consulting, and Watts and Associates. 2002a. *Powder/Tongue River Basin Plan.* February. Prepared for Wyoming Water Development Commission Basin Planning Program.

_____. 2002b. *Northeast Wyoming River Basin Plan.* February. Prepared for Wyoming Water Development Commission Basin Planning Program.

Hodges, Richard. 2007. Plant Promises Regional Impact. *Casper Star Tribune.* September 13.

Holcomb, J. 2003. *Rocky Mountain Pipeline Assessment.* Prepared for PACE Global Energy Services and presented at the Rocky Mountain Association of Geologists and Petroleum Technology Transfer Council CBM Symposium, Denver, CO. June 10.

Hydro-Engineering. 1991. *GAGMO 10-year Report.* Prepared for Gillette Area Groundwater Monitoring Organization by Hydro-Engineering, LLC. Casper, WY.

_____. 1996. *GAGMO 15-year Report.* Prepared for Gillette Area Groundwater Monitoring Organization by Hydro-Engineering, LLC. Casper, WY.

_____. 2001a. *GAGMO 20-year Report.* Prepared for Gillette Area Groundwater Monitoring Organization by Hydro-Engineering, LLC. Casper, WY.

_____. 2001b. *2000 GAGMO Annual Report.* Prepared for Gillette Area Groundwater Monitoring Organization by Hydro-Engineering, LLC. Casper, WY.

_____. 2005. *2004 GAGMO Annual Report.* Prepared for Gillette Area Groundwater Monitoring Organization by Hydro-Engineering, LLC. Casper, WY.

———. 2006. *2005 Annual GAGMO Report.* Prepared for Gillette Area Groundwater Monitoring Organization by Hydro-Engineering, LLC. Casper, WY.

———. 2007. *GAGMO 25-year Report.* Prepared for Gillette Area Groundwater Monitoring Organization by Hydro-Engineering, LLC. Casper, WY.

ICF Jones & Stokes. 2008. *Wetland Delineation Report: Buckskin Mining Company – Buckskin Mine Nationwide Permit 21 Renewal Project.* October. Portland, OR. Prepared for Buckskin Mining Company.

IHS Energy Services. 2004. Oil and Gas Production and Well History Database.

IMPROVE. 2005. *IMPROVE Summary Data – Summary Data through 2003.* Updated: February 2005. Available: <http://vista.cira.colostate.edu/improveData/IMPROVE/summary _data.htm>.

Intergovernmental Panel on Climate Change. 2001. *Third Assessment Report: Climate Change 2001.* Available: <http://www.ipcc.ch/ipccreports/index.htm>. Accessed: March 2009.

———. 2007. *Fourth Assessment Report: Climate Models and Their Evaluation.* Available: <http://www.ipcc.ch/pdf/assessmentreport/ar4/wg1/ar4-wg1-chapter8.pdf>.

Interline Resources. 2008. *Interline Announces Completion of NorthCut Refinery* and *Interline Purchases Expansion Property* (news releases). Available: <http://www.interlineresources.com/News>. Accessed: May 2009.

Jackson, S.T. and J.T. Overpeck. 2000. Responses of Plant Populations and Communities to Environmental Changes of the Late Quaternary. *Paleobiology* 26(4):194–220.

James, R. 2007. Electricity Technology in a Carbon-Constrained Future. In *Electric Perspectives.* November. Carnegie-Mellon University.

Jones & Stokes. 2007. *Paleontological Reconnaissance Survey Report for the Proposed Hay Creek II Lease by Application.* December 30. Prepared for the BLM, Wyoming State Office, Cheyenne, WY.

———. 2009. Wildlife Supplementary Baseline Information Report on the Affected Environment for the North and South Porcupine Coal Lease Applications. Prepared for Powder River Coal. On file at BLM High Plains District Office, Casper, WY. January.

LandTrak Resources, Inc. 2009. *Buckskin Mining Company Hay Creek II LBA Threatened and Endangered Species Survey.* BLM Data Adequacy Report.

Law, B.E., D.D. Rice, and R.M. Flores. 1991. Coalbed Gas Accumulations in the Paleocene Fort Union Formation, Powder River Basin, Wyoming. In Schwochow, S. D., D. K. Murray, and M. F. Fahy, (eds.) *Coalbed Methane of Western North America.* Rocky Mountain Association of Geologists Guidebook. Pp. 179–190.

Le Compte, J., and J.L. Anderson. 1982. *History of Northern Campbell County and the Rawhide Mine Permit Area, Wyoming.* Pioneer Archaeological Consultants, Longmont, CO. Report on file at the Wyoming Department of Environmental Quality, Land Quality Division, Cheyenne, WY.

Love, J. D., and A. C. Christiansen. 1985. *Geologic Map of Wyoming.* U.S. Geological Survey (three sheets).

Martin, W. 1999. Archaeological Investigations along the Wyoming Segment of the Express Pipeline. In William Martin and Craig S. Smith (eds.) *Contributions to Archaeology,* Volume 5, pp. 4-1 and 4-22. Project Synthesis. Laramie, WY: TRC Mariah Associates Inc.

Martin, L. J., D. L. Naftz, H. W. Lowham, and J. G. Rankl. 1988. *Cumulative Potential Hydrologic Impacts of Surface Coal Mining in the Eastern Powder River Structural Basin, Northeastern Wyoming (CHIA).* U.S. Geological Survey, Water Resources Investigations Report 88-4046. Prepared in cooperation with WDEQ and OSM. Cheyenne, WY.

Mine Safety and Health Administration. 1997. *The 645 Database, Wyoming Summary Employment and Injury Information.*

Minerals Management Service. 2006. *Mineral Revenue Management.* Federal Mineral Royalty Revenue Reported and Disbursed by State and Commodity. Available: <http://ww.mrm.mms.gov/MRMwebStats>.

Montana Department of Natural Resources and Conservation (MDNRC). 2010. *Trust Land Management Division.* Available: <http://dnrc.mt.gov/trust/MMB/otter_creek/Default.asp>.

National Academy of Science. 2006. *Managing Coal Combustion Residues in Mines.* National Academies Press. Available: <http://www.nap.edu/catalog/11592.html>.

National Association of Regulatory Utility Commissioners. 2007. *Summer Meeting.* Available: <http://www.naruc.org/>.

National Coal Transportation Association. 2007. *Ballast Fouling Initiative on the PRB Joint Line.* February 13. PowerPoint presentation. Available: <http://www.nationalcoaltransportation.org/events/BallastFoulingMitigation_2_13_07.pdf>. Accessed: July 23, 2008.

———. 2008. *Mission Statement.* Available: <http:// www.nationalcoaltransportation.org>. Accessed: July 23, 2008.

National Energy Technology Laboratory (NETL). 2009. Modern Shale Gas Development in the United States: A Primer. Prepared for the U.S. Department of Energy. Final EIS, Wright Area Coal Lease Applications. Pp 6–17.

National Institute for Occupational Safety and Health. 2005. *Pocket Guide to Chemical Hazards.*

National Oceanic and Atmospheric Administration. 1969. *Climatography of the United States: Asheville, North Carolina.* National Climatic Center, Climatological Summaries, No. 20–48.

———. 1985. *Narrative Summaries, Tables, and Maps for Each State, with Overview of State Climatologist Programs.* Third Edition. Volume 2: New York–Wyoming. Gale Research Company. Available: <http://www.wrds.uwyo.edu/sco/climate/wyoclimate.html>.

———. 2007. *Patterns of Greenhouse Warming. Geophysical Fluid Dynamics Laboratory Climate Modeling Research Highlights*:1(6). Available: <http://www.gfdl.noaa.gov/cms-filesystem-action/user_files/kd/pdf/gfdlhighlight_vol1n6.pdf>. Accessed: January 2010.

Natural Resources Conservation Service. 2004. *Soil Survey of Northern Campbell County.*

———. 2008. *Web Soil Survey 2.0.* Available: <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>. Accessed: May 15, 2008.

Naugle, D. E., C. L. Aldridge, B. L. Walker, T. E. Cornish, B. J. Moynahan, M. J. Holloran, K. Brown, G. D. Johnson, E. T. Schmidtmann, R. T. Mayer, D. Y. Kato, M. R. Matchett, T. J. Christiansen, W. E. Cook, T. Creekmore, R. D. Falise, E. T. Rinkes, and M. S. Boyce. 2004. West Nile Virus: Pending Crisis for Greater Sage-grouse. *Ecology Letters* 7:704–713.

Naugle, D. E., K. E. Doherty, and B. L. Walker. 2006. *Sage-grouse Winter Habitat Selection and Energy Development in the Powder River Basin: Completion Report.* Available: <http://www.voiceofthewild.org/sagegrousestudies>.

Newberry, G. S. 2008. *Buckskin Mining Company Hay Creek II Amendment Sections 7, 9, 18, and 19 T52N R72W and Sections 12, 13, and 24 T52N R73W Cultural Resource Inventory Report.* Gillette, WY: Antiquus Cultural Resource Consulting. Prepared for ICF Jones & Stokes.

Oedekoven, O. O. 2001. *Sage-grouse Job Completion Report, Sheridan Region.* Wyoming Game and Fish Department.

Office of Fossil Energy. 2009. *Modern Shale Gas Development in the United States: A Primer.* Available: <http://www.netl.doe.gov/technologies/oil-gas/publications/EPreports/Shale_Gas_Primer_2009.pdf>. Accessed: January 2010.

Office of Surface Mining Reclamation and Enforcement (OSM). 1984. Correlation and effect of mine facility wells on the Tullock Aquifer in the Gillette, Wyoming, vicinity. Prepared by G.E. McIntosh, C.A. Harrison and J.V. Wilcox.

Office of the Governor of Wyoming. 2008. *Executive Order 2008-2: Greater Sage-grouse Core Area Protection.* Available: <http://governor.wy.gov/Media.aspx?MediaId=588>. Accessed: January 2009.

Ogle, K.M. 2004. *Spatial Examination of Backfill Aquifer Water Quality, Powder River Basin, Wyoming, Using GIS.* Paper presented at the 2004 Advanced Integration of Geospatial Technologies in Mining and Reclamation, December 7–9, Atlanta GA.

Ogle, K.M. and M. Calle. 2006. Cumulative Hydrological Impact Assessment (CHIA) of Coal Mining in the Southern Powder River Basin, Wyoming. Wyoming Department of Environmental Quality, Land Quality Division, WDEQ-CHIA-19. 122 pp.

Ogle, K.M., M. Calle, G. Mooney, and D.N. Dornak. 2005. *Cumulative Hydrological Impact Assessment of Coal Mining in the Middle Powder River Basin, Wyoming.* Wyoming Department of Environmental Quality, Land Quality Division. WDEQ-CHIA-14.

PacifiCorp. 2007. *Wyoming Industrial Development Information and Siting Act, 109 Application Permit, Glenrock/Rolling Hills Wind Energy Project.* Available: <http://deq.state.wy.us/isd/downloads/Glenrock%20ISA%20Final_1125-07.pdf>. Accessed: May 2008.

Pitchford, M.L., and W.C. Malm. 1994. Development and Applications of a Standard Visual Index. *Atmospheric Environment* 28(5):1,049–1,054.

Quick, J.C., T.C. Brill, and D.E. Tabet. 2003. Mercury in U.S. Coal: Observations Using the COALQUAL and ICR Data. In *Environmental Geology* 43:247–259

Reuters. 2007. *CONSOL Energy, Pittsburg & Midway Coal Announce Venture to Develop New Powder River Basin Coal Mine.* April 24.

Rice, D.D. 1993. Compositions and Origins of Coalbed Gas. In B. E. Law, D. D. Rice (eds.) *Hydrocarbons from Coal. American Association of Petroleum Geologists Studies in Geology* 34:159–184.

Rice, D.D. and G.E. Claypool. 1981. Generation, Accumulation, and Resource Potential of Biogenic Gas. *American Association of Petroleum Geologists Bulletin* 65:5–25.

Robinson, P., G.F. Gunnell, S.L. Walsh, W.C. Clyde, J.E. Storer, R.K. Stucky, D.J. Froehlich, I. Ferrusquia-Villafranca, and M.C. McKenna. 2004. Wasatchian through Duchesnean Biochronology. In M. O. Woodburne (ed.) *Late Cretaceous and Cenozoic Mammals of North America,* pp. 106–155. NY: Columbia University Press.

Rockies Express Pipeline, LLC. 2008. *Rockies Express Pipeline*. Available: <http://www.rexpipeline.com>. Accessed: May 2008.

Roehler, H.W. 1991. *Revised Stratigraphic Nomenclature for the Wasatch and Green River Formations of Eocene Age, Wyoming, Utah, and Colorado.* U.S. Geological Survey Professional Paper 1506-B.

Rogers, Andrew. 2008. Wind farm may take longer, cost more. Gillette News-Record, Gillette, WY. September 24.

ROMCOE. 1982. *Center for Environmental Problem Solving, Rapid Growth Communities Project, Community Profiles*. July. Boulder, CO.

Rosenberg, R.G. 1990. *A Historical Synthesis of the Eastern Powder River Basin, Campbell and Converse Counties, Wyoming.* Prepared for the Wyoming State Historic Preservation Office. Cheyenne, WY: Archives, Museum, and Historical Department, Barrett Building.

Schneider, E.A., J. Johnston, and J. Lowe. 2000. *Buckskin Mine Expansion Permit.* Appendices D-2 and D-3A. Laramie, WY: TRC Mariah Associates, Inc. Prepared for Triton Coal Company's Buckskin Mine.

Scire, J.S., D.S. Strimitis, and R.J. Yamartino. 1999. *A User's Guide for the CALPUFF Dispersion Model* (version 5.0). October. Concord, MA: Earth Tech, Inc.

Secord, R. 1998. Paleocene Mammalian Biostratigraphy of the Carbon Basin, Southeastern Wyoming, and Age Constraints on Local Phases of Tectonism. In *Rocky Mountain Geology* 33(1):119–154.

Shelley, K.J. 1992. *Habitat Reclamation for Birds and Small Mammals on Surface-mined Lands in the Powder River Basin, Wyoming.* Master's thesis. Laramie, WY: University of Wyoming.

Sundstrom, C., W.G. Hepworth, and K.L. Diem. 1973. *Abundance, Distribution, and Food Habits of Pronghorn.* Wyoming Game and Fish Commission, Bulletin No. 12, 51 pp.

Surface Transportation Board. 2008. *Surface Transportation Board Approves Canadian Pacific Railway's Acquisition of Control of the Dakota, Minnesota & Eastern Railroad, Subject to Conditions.* Available: <http://www.stb.dot.gov/__85256593004F576F.nsf/0/92E608894122E 673852574D40051052C?OpenDocument>. Accessed: February 2009.

Tausch, R.J., C.L. Nowak, and S.A. Mensing. 2004. Climate Change and Associated Vegetation Dynamics during the Holocene: The Paleoecological Record. In *Great Basin Riparian Ecosystems: Ecology, Management, and Restoration,* J. C. Chambers and J. R. Miller (eds.). Island Press.

Thunder Basin Coal Company. 2002. *Black Thunder Mine Report for Development of SAE Setback Distances for Blasting Activities at the Black Thunder Mine.* July.

Ulrich and Bower. 2008. *International Journal of Coal Geology.* 76(25):1–2.

U.S. Bureau of Economic Analysis. 2006. *Regional Economic Information System – Full-time and Part-time Employment by NAICS, 1969–2004, and Personal Income and Earnings NAICS, 1969–2004.* Available: <http://www.bea.gov/regional/ index.htm#state>.

———. 2009. *Gross Domestic Product by State, 2008.* Available: <http://www.bea.gov/regional/gsp/>. Accessed: March 30, 2009.

U.S. Bureau of Labor Statistics. 2007. *Local Area Unemployment Statistics, 1997–2006, Not Seasonally Adjusted.* Available: <http://data.bls.gov/>.

———. 2009. *Local Area Unemployment Statistics—1997 to 2009, Not Seasonally Adjusted.* Available: <http://data.bls.gov/>. Accessed: March 30, 2009.

U.S. Bureau of Land Management. 1974. *Final Environmental Impact Statement, Eastern Powder River Basin of Wyoming.* Cheyenne, WY.

_____. 1979. *Final Environmental Impact Statement, Proposed Development of the Coal Resources in the Eastern Powder River of Wyoming.* Washington, D.C.

_____. 1981. *Final Powder River Regional Coal Environmental Impact Statement.* Cheyenne, WY.

_____. 1984. *Draft Environmental Impact Statement of Round Coal II Coal Lease Sale in the Powder River Region.* Cheyenne, WY.

———. 1985. *Buffalo Resource Area Resource Management Plan Environmental Impact Statement.* Casper, WY.

———. 1987. *Data Adequacy Standards for Powder River Coal Region.* Casper, WY.

———. 1989. *Manual 3420, Competitive Coal Leasing.* Washington, D.C.

_____. 1991. *Powder River Regional Coal Team Operational Guidelines for Coal Lease-by-Applications.* Cheyenne, WY.

_____. 1994. *Final Environmental Assessment for the Eagle Butte Coal Lease Application.*

_____. 2001. *Approved Resource Management Plan for Public Lands Administered by the Bureau of Land Management Buffalo Field Office.* Buffalo, WY. Available: <http://www.wy.blm.gov>.

_____. 2003. *Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project.* January. Buffalo Field Office, Buffalo, WY.

_____. 2004. *Final Environmental Impact Statement for the West Hay Creek Coal Lease Application, Federal Coal Lease Application WYW151634.* June. Wyoming State Office, Casper Field Office.

_____. 2005a. *Task 3C Report for the Powder River Basin Coal Review—Cumulative Social and Economic Effects.* December. Prepared for the BLM State Office and BLM Wyoming Casper Field Office by ENSR Corporation, Fort Collins, CO. Available: <http://www.blm.gov/wy/st/en/programs/energy/Coal_Resources/PRB_Coal/prbdocs.html>.

_____. 2005b. *Task 2 Report for the Powder River Basin Coal Review—Past and Present and Reasonably Foreseeable Development Activities.* December. Prepared for the BLM Wyoming State Office, BLM Wyoming Casper Field Office, and BLM Montana Miles City Field Office by ENSR Corporation, Fort Collins, CO.

_____. 2005c. *Task 1A Report for the Powder River Basin Coal Review—Current Air Quality Conditions.* September. Prepared for the BLM Wyoming State Office, BLM Wyoming Casper Field Office, and BLM Montana Miles City Field Office by ENSR Corporation, Fort Collins, CO.

_____. 2005d. *Task 1C Report for the Powder River Basin Coal Review—Current Social and Economic Conditions.* March. Prepared for the BLM State Office and BLM Wyoming Casper Field Office by ENSR Corporation, Fort Collins, CO. Available: <http://www.blm.gov/wy/st/en/programs/energy/Coal_Resources/PRB_Coal/prbdocs.html>.

_____. 2005e. *Task 1D Report for the Powder River Basin Coal Review—Current Environmental Conditions.* June. Prepared for the BLM Wyoming State Office, BLM Wyoming Casper Field Office, and BLM Montana Miles City Field Office by ENSR Corporation, Fort Collins, CO.

_____. 2005f. *Task 3D Report for the Powder River Basin Coal Review—Cumulative Environmental Effects.* December. Prepared for the BLM Wyoming State Office, BLM Wyoming Casper Field Office, and BLM Montana Miles City Field Office by ENSR Corporation, Fort Collins, CO.

_____. 2005g. *Appendix F of the Land Use Planning Handbook, BLM Handbook H-1601-1.* March 11. Available: <http://www.blm.gov/pgdata/etc/medialib/blm/ak/aktest/planning/planning_general.Par.65225.File.dat/blm_lup_handbook.pdf X>.

———. 2006a. *Instruction Memorandum No. 2006-153.* Policy and Guidance on Conflicts between Coalbed Natural Gas and Surface Coal Development in the Powder River Basin. Reissued: May 11, 2006.

———. 2006b. *Powder River Basin Coal Leases by Application Data Sheets.* Available: <http://www.wy.blm.gov/minerals/coal/prb/LBA_title.htm>. Accessed: January 2009.

———. 2006c. *Task 1B Report for the Powder River Basin Coal Review—Current Water Resource Conditions.* September. Prepared for the BLM Wyoming State Office, BLM Wyoming Casper Field Office, and BLM Montana Miles City Field Office by ENSR Corporation, Fort Collins, CO.

———. 2006d. *Task 3A Report for the Powder River Basin Coal Review—Cumulative Air Quality Effects.* February. Prepared for the BLM Wyoming State Office, BLM Wyoming Casper Field Office, and BLM Montana Miles City Field Office by ENSR Corporation, Fort Collins, CO.

———. 2006e. *Task 3B Report for the Powder River Basin Coal Review—Cumulative Water Effects.* Prepared for the BLM Wyoming State Office, BLM Wyoming Casper Field Office, and BLM Montana Miles City Field Office by ENSR Corporation, Fort Collins, Colorado, August 2006.

———. 2007a. *Status of Public Domain Land and Mineral Titles, Approved Master Title Plats.* Available: <http://www.blm.gov/wy/st/en/resources/public_room/mtps.html >. Accessed: December 20, 2007.

———. 2007b. *Memorandum Regarding Potential Fossil Yield Classification (PFYC) System for Paleontological Resources on Public Lands.* October 15. Available: <http://www.blm.gov/wo/st/en/prog/more/CRM/paleontology/paleontological_laws.html>. Accessed: June 26, 2008.

_____. 2007c. *Final Environmental Impact Statement for the Eagle Butte West Coal Lease Application, WYW155132.* August. Casper Field Office, Casper, WY.

_____. 2008a. *Update of Task 3A Report for the Powder River Basin Coal Review Cumulative Air Quality Effects for 2015.* October. Prepared for the BLM Wyoming State Office, BLM Wyoming Casper Field Office, and BLM Montana Miles City Field Office by ENSR Corporation, Fort Collins, CO.

_____. 2008b. *NEPA Handbook H-1790-1.* Washington, D.C.

———. 2008c. *Status of Public Domain Land and Mineral Titles, Approved Coal Plat.* Available: <http://www.blm.gov/wy/st/en/resources/public_room/mtps.html >. Accessed: February 28, 2008.

———. 2008d. *Invited Field Survey.* Observations and measurements by BLM Casper Field Office staff. July 7.

———. 2008e. *West Antelope II DEIS Public Hearing.* March 24. Gillette, WY.

———. 2008f. *Powder River Basin Coal Sales—2008 News Releases.* Available: <http://www.blm.gov/wy/st/en/info/news_room/2008.html>. Accessed: May 24, 2008.

———. 2009a. *Powder River Basin Coal Leases by Application.* Last updated: April 7, 2009. Available: <http://www.blm.gov/wy/st/en/programs/energy/Coal_Resources/PRB_Coal/lba_title.html>. Accessed: May 14, 2009.

———. 2009b. *Split Estate.* Available: <http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices/split_estate.html>.

———. 2009c. *Update of the Task 2 Report for the Powder River Basin Coal Review – Past and Present and Reasonably Foreseeable Development Activities.* Prepared for the BLM High Plains District Office and Wyoming State Office by AECOM, Inc., Fort Collins, CO. Available: <http://www.blm.gov/wy/st/en/programs/energy/Coal_Resources/ PRB_Coal/prbdocs.html>.

———. 2009d. *Update of the Task 3A Report for the Powder River Basin Coal Review – Cumulative Air Quality Effects for 2020.* December. Prepared for the BLM High Plains District Office and Miles City Field Office by AECOM, Inc., Fort Collins, CO. Available: <http://www.blm.gov/wy/st/en/programs/energy/Coal_Resources/PRB_Coal/prbdocs.html>.

———. 2009e. *Update of the Task 1B Report for the Powder River Basin Coal Review – Current Water Resources Conditions.* November. Prepared for the BLM High Plains District Office and Wyoming State Office by AECOM, Inc., Fort Collins, CO. Available: <http://www.blm.gov/wy/st/en/programs/energy/Coal_Resources/PRB_Coal/prbdocs.html>.

———. 2009f. *Update of the Task 3B Report for the Powder River Basin Coal Review – Cumulative Water Resources Effects.* December. Prepared for the BLM High Plains District Office and Wyoming State Office by AECOM, Inc., Fort Collins, CO. Available: <http://www.blm.gov/wy/st/en/programs/energy/Coal_Resources/PRB_Coal/prbdocs.html>.

———. 2009g. *Task 3D Report.* Update of the Task 3D Report for the Powder River Basin Coal Review – Cumulative Environmental Effects (w/track changes). December. Prepared for the BLM High Plains District Office by AECOM, Inc., Fort Collins, CO. Available: <http://www.blm.gov/wy/st/en/programs/energy/Coal_Resources/PRB_Coal/prbdocs.html>.

———. 2009h. *Final Environmental Impact Statement for the South Gillette Area Coal (SGAC) Lease Applications.* August. High Plains District Office, Casper, WY.

U.S. Census Bureau. 2000. *Summary File 3, Matrices P53, P77, P82, P87, P90, PCT47, and PCT52.* Available: <http://factfinder.census.gov/servlet/GCTTable?_bm=y&-context=gct&-ds_name=DEC_2000_SF3_U&-mt_name=DEC_2000_SF3_U_GCTP14_ST2&-CONTEXT=gct&-tree_id=403&-geo_id=04000US56&-format=ST-2&-_lang=en>.

———. 2001. *2000 Census of Population and Housing – Wyoming.* Available: <http://www.census.gov>.

———. 2006a. *Small Area Income and Poverty Estimates Program.* Available: <http://www.census.gov//did/www/saipe/index.html>.

———. 2006b. *Annual Estimates of Population for Counties of Wyoming: April 1, 2000, to July 1, 2006 (CO-EST2006-01-56).* Available: <http://www.census.gov/popest/counties/CO-EST200601.html>. Accessed: August 2006.

———. 2006c. *Annual Estimates of Housing Unit Counts in Wyoming: April 1, 2000, to July 1, 2005 (HU-EST2005-04-56).* Available: <http://www.census.gov/popest/housing/HUEST2005-4.html>. Accessed: August 21, 2006.

———. 2007. *Annual Estimates of Population for Counties of Wyoming: April 1, 2000, to July 1, 2007 (CO-EST2007-01-56).* Available: <http://www.census.gov/popest/counties/CO-EST2007-01.html>. Accessed: August 2008.

———. 2008a. *Annual Estimates of Population for Incorporated Places in Wyoming: April 1, 2000, to July 1, 2007 (CO-SUB-EST2007-04-56).* July 10. Washington, D.C. Available: <http://www.census.gov/popest/counties/SUB-EST2008-01.html>. Accessed: March 30, 2009.

———. 2008b. *Annual Estimates of Housing Unit Counts in Wyoming: April 1, 2000, to July 1, 2007 (HU-EST2007-04-56).* August 21. Washington, D.C. Available: <http://www.census.gov/popest/housing/HU-EST2007-4.html>. Accessed: March 30, 2009.

———. 2009. Table 1. Annual Estimates of the Resident Population for Counties of Wyoming: April 1, 2000 to July 1, 2009 (CO-EST2009-01-56).

U.S. Climate Change Science Program. 2008a. *The Effects of Climate Change on Agriculture, Land Resources, Water Resources, and Biodiversity in the United States.* Available: <http://www.climatescience.gov/Library/sap/sap4-3/finalreport/default.htm>. Accessed: May 2009.

———. 2008b. *Climate Models: An Assessment of Strengths and Limitations.* Synthesis and Assessment Product 3.1. July. Available: <http://www.climatescience.gov/Library/sap/sap3-1/final-report/sap31-final-all.pdf>. Accessed: February 2010.

USDA Forest Service. No date. *Land Use Summary Report for Project LA-WY-1.* Land Acquisitions File, Forest Service Permanent Records, Douglas District Office, Resettlement Program, Homestead Files.

———. 2009. *Ecoregions*. Updated: June 9, 2009. Available: <http://www.fs.fed.us/re/ecoregions>. Accessed: September 30, 2009.

U.S. Department of Energy. 2006. *Mercury Emission Control R&D.* Available: <http://www.fossil.energy.gov/programs/powersystems/pollutioncontrols/overview_mereurycontrols.ht ml>. Accessed: July 2008.

———. 2007. *Carbon Sequestration Atlas of the United States and Canada*, 87 pp. Office of Fossil Energy, NETL, Washington D.C. Note: This document is intended to be continuously updated.

———. 2009a. *Coal*. Available: <http://www.energy.gov/energysources/coal.htm>. Accessed: February 2009.

———. 2009b. *Department of Energy Takes Another Step Forward on FutureGen Project in Matton, IL.* Record of Decision issued on first U.S. commercial-scale carbon capture and storage project. Press release. July 14. Available: <http://www.fossil.energy.gov/news/technologies/2009/09045DOE_signs_FutureGen_ROD.html>. Accessed: August 2009.

U.S. Department of Labor. 2009. *Mine Safety and Health Administration Mission.* Available: <http://www.msha.gov/MSHAINFO/MISSION.HTM>. Accessed: July 2009.

U.S. Energy Information Administration. 1994. *Carbon Dioxide Emission Factors for Coal.* August. Available: <http://www.eia.doe.gov/cneaf/coal/quarterly/co2_article/co2.html>. Accessed: May 2009.

———. 2007a. *2006 Annual Coal Report.* Available: <http://www.eia.doe.gov/fueleoal.html>. Accessed: February 2009.

———. 2007b. *Annual Energy Outlook 2007 with Projections to 2030.* February. Available: <http://www.eia.doe.gov/oiaf/archive/aeo07/ issues.html>. Accessed: January 2010.

———. 2008a. *Coal News and Markets, A Report Series on Coal Production and Prices.* Available: <www.eia.doe.gov/cneaf/coal/page/coalnews>. Accessed: November 17, 2008.

———. 2008b. *Emissions of Greenhouse Gases in the United States, 2007.* DOE/EIA-0573(2007). December. Office of Integrated Analysis and Forecasting, Washington, D.C.

———. 2008c. *Annual Energy Outlook 2008 with Projections to 2030.* April. Available: <http://www.eia.doe.gov/bookshelf/brochures/aeo/ index.html>. Accessed: February 2009.

———. 2009a. *2008 Annual Coal Report.* DOE/EIA 0584(2008). September. Available: <http://www.eia.doe.gov/cneaf/coal/page/acr/acr.pdf>.

———. 2009b. *Annual Energy Outlook 2010 Early Release.* December.

———. 2009c. *Electric Power Industry 2009: Year in Review.* Figure ES 1, U.S. Electric Power Industry Net Generation. November 23. Available: <http://www.eia.doe.gov/cneaf/electricity/epa/epa_sum.html>. Accessed: December 12, 2010.

———. 2009d. *Emissions of Greenhouse Gases in the United States 2008.* DOE/EIA 0573(2008). December. Available: <http://www.eia.doe.gov/oiaf/1605/ggrpt/0573(2008).pdf>. Accessed: February 2010.

———. 2009e. *Annual Energy Outlook 2009 with Projections to 2030.* March. Available: <http://www.eia.doe.gov/oiaf/aeo/pdf/0383(2009).pdf>. Accessed: January 2010.

U.S. Environmental Protection Agency. 1974. *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety.* EPA 550/9-74-004. March.

———. 1999. *Regional Haze Regulations.* Federal Register Volume 64, Number 126. July 1.

———. 2001a. Region 8 comment letter to Nancy Doelger, BLM, on the North Jacobs Ranch Coal Lease Application DEIS. March 1. Reference to WMA Report "PRB Short-Term Exposure NO_2 Study," April 2000.

———. 2001b. *Visibility in Mandatory Federal Class I Areas (1994–1998): A Report to Congress, Executive Summary.* November.

———. 2002a. *EPA AQS Database, EPA Air Explorer, AQS Site ID's: 56-005-0808, 56-005-0900, 56-005-0906, Parameter: PM10, AQS Site Name: Eagle Butte Mine, Campbell County, WY.* Available: <http://www.epa.gov/mxplorer/index.htm>.

———. 2002b. *EPA AQS Database, EPA Air Explorer, AQS Site ID: 56-005-0899, Parameter: PM2.5, AQS Site Name: WDEQ-AQD Buckskin Mine, Campbell County, WY.* Available: <http://www.epa.gov/mxplorer/index.htm>.

———. 2002c. *Characterization and Management of Residues from Coal-Fired Power Plants.* Interim Report, EPA-600/R-02-083. December.

———. 2003a. Region 8 comment letter to Nancy Doelger, BLM, on the South Powder River Basin Coal DEIS. April 16.

———. 2003b. *Coal Combustion Products Partnership (C2P2) Fact Sheet.* EPA530-F-03-004. January.

_____. 2004. *Methane Release from Coal Mining: Methane Tracking and Mitigation Options,* version 1.0. October 15. Coalbed Methane Outreach Program (CMOP). Available: <www.epa.gov/methane/excel/MethaneSubModelInputData_Final.xls>.

_____. 2005a. *AQS Database, EPA Air Explorer, AQS Site ID: 56-005-0123, Parameter: ozone, AQS Site Name: THUNDER BASIN GRASSLAND SITE 35 MI N-NE, Campbell County, WY.* Available: <http://www.epa.gov/mxplorer/index.htm>.

_____. 2005b. *Effects of Acid Rain: Lakes and Streams.* Available: <http:// www.epa.gov/ airmarkets/ acidrain /effects/surfacewater.html>. Accessed: April 2005.

_____. 2005c. *Metrics for Expressing Greenhouse Gas Emissions: Carbon Equivalents and Carbon* Dioxide Equivalents. No. EPA420-F-05-002. February.

_____. 2005d. News Release: Coal Waste Becomes Viable Product. Available: <http://www.circainfo.ca/pdf/ US%20EPA%20Press%20Release.pdf>. Accessed: May 2008.

_____. 2006a. *AQS Database, EPA Air Explorer, AQS Site ID: 56-005-0123, Parameter: ozone, AQS Site Name: THUNDER BASIN GRASSLAND SITE 35 MI N-NE, Campbell County, WY.* Available: <http://www.epa.gov/mxplorer/index.htm>.

_____. 2006b. *EPA's Roadmap for Mercury.* EPA-HQOPPT-2005-0013. Available: <http://www.epa.gov/mercury/ roadmap.htm>. Accessed: July 29, 2008.

_____. 2007a. *AQS Database, EPA Air Explorer, AQS Site ID: 56-005-0123, Parameter: ozone, AQS Site Name: THUNDER BASIN GRASSLAND SITE 35 MI N-NE, Campbell County, WY.* Available: <http://www.epa.gov/mxplorer/index.htm>.

_____. 2007b. *NO_x—How Nitrogen Oxides Affect the Way We Live and Breathe – Chief Causes for Concern.* Available: <http://www.epa.gov/air/urbanair/nox/chf.html.

_____. 2007c. *Particle Pollution, Health, and Environment.* Available: <http://www.epa.gov/air/particlepollution/health.html>.

_____. 2007d. *Clean Energy, eGRID, 2007.* 2006 version 2.1. April.

_____. 2007e. *About Coal Combustion Products.* Available: <http://www.epa.gov/epawaste/conserve/rrr/imr/ccps/index.htm>. Accessed: May 2009.

_____. 2007f. *Fly Ash.* Available: <http://www.epa.gov/epawaste/conserve/rrr/imr/ ccps/flyash.htm>. Accessed: May 2009.

_____. 2007g. *Bottom Ash.* Available: <http://www.epa.gov/epawaste/conserve/rrr/imr/ ccps/bottomash.htm>. Accessed: May 2009.

_____. 2007h. *Boiler Slag.* Available: <http://www.epa.gov/epawaste/conserve/rrr/imr/ ccps/boilslag.htm >. Accessed: May 2009.

———. 2007i. *Flue Gas Desulfurization Material.* Available: <http://www.epa.gov/epawaste/conserve/rrr/imr/ccps/fgd.htm>. Accessed: May 2009.

———. 2008a. *AQS Database, EPA Air Explorer, AQS Site ID: 56-005-0123, Parameter: ozone, AQS Site Name: THUNDER BASIN GRASSLAND SITE 35 MI N-NE, Campbell County, WY.* Available: <http://www.epa.gov/mxplorer/index.htm>.

———. 2008b. *Climate Change—Science—State of Knowledge.* Available: <http://www.epa.gov/climatechange/science/stateofknowledge.html>. Accessed: May 2009.

———. 2008c. *Transportation and Climate.* Available: <http://www.epa.gov/otaq/climate>. Accessed: May 2009.

———. 2008d. *Mercury: Basic Information.* Available: <http://www.epa.gov/mercury/about.htm>. Accessed: May 2009.

———. 2008e. *EPA Recognizes Leadership in Beneficial Uses of Industrial Materials.* Available: <http://yosemite.epa.gov/opa/admpress.nsf/0/4F3C92C9741B1827852 5747A00632626>. Accessed: May 2009.

———. 2009a. *AQS Database, EPA Air Explorer, AQS Site ID: 56-005-0123, Parameter: ozone, AQS Site Name: THUNDER BASIN GRASSLAND SITE 35 MI N-NE, Campbell County, WY.* Available: <http://www.epa.gov/mxplorer/index.htm>.

———. 2009b. *AQS Database, EPA Air Explorer, AQS Site ID's: 56-009-0819 (Antelope Mine), 56-005-0892 (Belle Ayr Mine), 56-005-0123 (Thunder Basin Grassland Site), 56-005-0456 (Campbell County), and 56-005-0789 (Tracy Ranch); Parameter: NO_2.* All sites are in Campbell County, WY, except Antelope Mine, which is in Converse County, WY. Available: <http://www.epa.gov/mxplorer/index.htm>. Accessed: 2009.

———. 2009c. *Reducing Acid Rain.* Available: <http://www.epa.gov/acidrain/reducing/>.

———. 2009d. *Endangerment and Cause or Contribute Findings for Greenhouse Gases under the Clean Air Act.* Available: <http://www.epa.gov/climatechange/endangerment.html>. Accessed: December 2009.

———. 2009e. *Clean Energy, Air Emissions.* Available: <http://www.epa.gov/solar/energy-and-you/affect/air-emissions.html>. Accessed: February 2009.

———. 2009f. *Mercury Emissions: The Global Context.* Available: <http://www.epa.gov/mercury/control_emissions/global.htm>. Accessed: February 2009.

———. 2009g. *Benefits of Using CCPs.* Available: <http://www.epa.gov/epawaste/partnerships/c2p2/use/benefits.htm>. Accessed: May 2009.

———. 2009h. *Coal Combustion Products Partnership, C2P2.* Available: <http://www.epa.gov/epawaste/partnerships/c2p2/index.htm>. Accessed: February 2009.

———. 2010. *Email Hotline, GHG Reporting Rule and Coal Mines.* January 27.

U.S. Fish and Wildlife Service. 2002. *Coal Mine List of Migratory Bird Species of Management Concern in Wyoming, based on Wyoming Bird Conservation Plan*, version 1.0. Report available from Wyoming Field Office, Cheyenne, WY.

———. 2004. *Letter to Interested Parties Regarding Black-footed Ferret Surveys in Wyoming.* File ES-61411/BFF/WY7746. February 2.

———. 2007. *Wetlands Online Mapper.* Available: <http://wetlandsfws.er.usgs.gov/NWI/index.html>. Accessed: November 10, 2007.

———. 2008. *Mountain/Prairie Region Endangered Species Program – Mountain Plover.* Available: <www.fws.gov/mountain%2Dprairie/species/birds/mountainplover>. Accessed: January 2008.

———. 2010. *Twelve-month Finding on a Petition to List the Black-Tailed Prairie Dog as Threatened or Endangered.* Endangered Species of the Mountain-Prairie Region. Federal Register, Volume 74, No. 231, p. 63344. Available: <http://www.fws.gov/mountain-prairie/species/mammals/btprairiedog/74FR63343.pdf>. Accessed: May 2010.

U.S. Geological Survey. 2000. *Health Impacts of Coal Combustion.* U.S. Geological Survey Fact Sheet FS-094-00. July.

_____. 2002a. *Assessment of Undiscovered Oil and Gas Resources of the Powder River Basin Province of Wyoming and Montana, 2002.* U.S. Geological Survey Fact Sheet FS–146–02. November.

_____. 2002b. *Characterization and Modes of Occurrence of Elements in Feed Coal and Fly Ash—An Integrated Approach.* U.S. Geological Survey Fact Sheet-038-02. May.

_____. 2004. *Total Petroleum System and Assessment of Coalbed Gas in the Powder River Basin Province, Wyoming and Montana.* U.S. Geological Survey Data Series 69-C.

_____. 2006. *Gas Desorption and Adsorption Isotherm Studies of Coals in the Powder River Basin, Wyoming and Adjacent Basins in Wyoming and North Dakota.* Open-File Report 2006-1174.

_____. 2008. *State-by-State List of Mining Region – Wyoming.* Available: <http://neic.usgs.gov/neis/mineblast/source.html>. Accessed: August 2008.

U.S. Global Change Research Program. 2009. *Global Climate Change Impacts in the United States.* Available: <http://www.globalchange.gov/images/cir/pdf/20page-highlightsbrochure.pdf>. Accessed: December 2009.

U.S. Nuclear Regulatory Commission. 2009. *Locations of Uranium Recovery Facilities.* Available: <http://www.nrc.gov/info-finder/materials/uranium/>. Accessed: December 2009.

U.S. Office of Surface Mining Reclamation and Enforcement (OSM). 1984. *Correlation and Effect of Mine Facility Wells on the Tullock Aquifer in the Gillette, Wyoming, Vicinity.* Prepared by G.E. McIntosh, C.A. Harrison, and J.O. Wicox.

———. 2007a. *Questions and Answers for the Announcement of Decisions Needed to Distribute Funds for FY2008 under the 2006 Amendments to SMCRA.* Available: <http://www.osmre.gov/news/120607QA.pdf>. Accessed: April 13, 2007.

———. 2007b. *The 2006 Amendments to the Surface Mining Control and Reclamation Act.* Fact Sheet to Accompany News Release. Available: <http://www.osmre.gov/news/120607FactSheet.pdf>. Accessed: April 13, 2007.

———. 2008. *Annual Revaluation* (July 1, 2007 to June 30, 2008). Available: <http://www.osmre.gov/Reports/EvalInfo/2008/WY08-reg.pdf>. Accessed: January 2009.

Union Pacific Railroad. 2005. *Southern Powder River Updates—2005.* Available: <http://www.uprr.com/customers/energy/sprb/updates_2005.shtm>. Accessed: January 2008.

———. 2006. *Southern Powder River Updates—2006 Year-end Review.* Available: <http://www.uprr.com/customers/energy/sprb/updates.shtm>. Accessed: January 2008.

Wang, J.X.L. and J.K. Angell. 1999. *NOAA/Air Resources Laboratory ATLAS No. 1, Air Stagnation Climatology for the United States (1948–1998).* April. Air Resources Laboratory Environmental Research Laboratories, Office of Oceanic and Atmospheric Research, Silver Spring, MD.

Waters, T.F. 1995. Sediment in Streams, Sources, Biological Effects and Control. In *American Fisheries Society Monograph* 7. 251 pp.

Western Regional Climate Center. 2008. Agency web page. Available: <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?wy3855>. Accessed: March 4, 2008.

WWC Engineering. 2009. EIS Technical Support Document for CO2e Emissions Calculations. Using known CO2e emission source values to estimate the unknown source values and the combined CO2e emission source values expected at the Black Thunder, Jacobs Ranch, and North Antelope Rochelle mines if the North Hilight Field, South Hilight Field, West Jacobs Ranch, North Porcupine and South Porcupine LBA Tracts are added to the mines' operations. Available on request from BLM Casper Field Office. March.

World Information Service on Energy. 2007. *New Uranium Mining Projects Wyoming, USA.* Available: < http://www.wise-uranium.org/upusawy.html>. Accessed: May 2009.

Wyoming Consensus Revenue Estimating Group. 2007. *Wyoming State Government Revenue Forecast, Fiscal Year 2008–Fiscal Year 2012.* Available: <http://eadiv.state.wy.us/creg/GreenCREG_Oct07.pdf>. Accessed: November 7, 2007.

———. 2008. *Wyoming State Government Revenue Forecast, Fiscal Year 2008–Fiscal Year 2012.* Available: <http://eadiv.state.wy.us/creg/GreenCREG_Jan08.pdf>. Accessed: April 7, 2008.

Wyoming Department of Administration and Information. 2006. *Economic Analysis Division, Wyoming Population, Cost of Living, Economic, and Demographic Data.* Available: <http://eadiv.state.wy.us>.

———. 2008. *Wyoming Cost of Living for the Fourth Quarter 2007.* Available: <http://eadiv.state.wy.us>. Accessed: April 7, 2008.

Wyoming Department of Education. 2006. *Statistical Report Series, Report No. 1, 2 and 3.* Available: <http://www.k12.wy.us/statistics/index.html>.

———. 2008. *Statistical Report Series, Report No. 1, 2, and 3.* Available: <http://www.k12.wy.us/statistics/index.html>. Accessed: April 2008.

Wyoming Department of Employment. 1990. *Office of the State Inspector of Mines, Annual Report for the Year Ending December 31, 1990.*

_____. 1995. *Office of the State Inspector of Mines, Annual Report for the Year Ending December 31, 1995.*

_____. 2000. *Office of the State Inspector of Mines, Annual Report for the Year Ending December 31, 2000.*

_____. 2003. *Office of the State Inspector of Mines, Annual Report for the Year Ending December 31, 2003.*

_____. 2007. *Office of the State Inspector of Mines, Annual Report for the Year Ending December 31, 2006.*

———. 2009a. *Annual Report of the State Inspector of Mines of Wyoming, Year Ending December 31, 2008.* Rock Springs, WY.

———. 2009b. *Labor Market Information—Quarterly Census of Employment and Wages, First Quarter 2008.* Casper, WY. Available: <http://doe.state.wy.us/lmi/08Q1_QCEW>. Accessed: March 30, 2009.

———. 2009c. *2003 Labor Market Information—Quarterly Census of Employment and Wages, 1st Quarter 2003.* Casper, WY. Available: <http://doe.state.wy.us/lmi/03Q1_202>. Accessed: March 30, 2009.

Wyoming Department of Environmental Quality. 2003. *Wyoming's Long-Term Strategy for Visibility Protection.* Final 2003 Review Report. May 29. Air Quality Division. Available: <http://deq.state.wy.us/aqd/prop/2003%20LTSReview.pdf>.

———. 2005a. *Wyoming Visibility Monitoring Network.* Land Quality Division. Available: <www.wyvisnet.com/all.html>.

———. 2005b. *Water Quality Rules and Regulations.* Water Quality Division.

———. 2006. *Buckskin Mining Company, AP-4972.* Application analysis, p. 25. December 13.

———. 2007. *Industrial Siting News: Basin Electric Awarded Permit.* Industrial Siting Division. Available: <http://deq.state.wy.us/isd/isdnews.htm>. Accessed: March 2007.

———. 2008. *Wyoming Ambient Air Monitoring Annual Network Plan 2008.* Available: <http://deq.state.wy.us/aqd/downloads/AirMonitor/Network%20Plan_ 2008.pdf>. Accessed: May 2009.

———. 2009. *Wyoming Visibility Program.* Available: <http://deq.state.wy.us/aqd/visibility.asp>. Accessed: December 2009.

Wyoming Department of Environmental Quality/Industrial Siting Division (WDEQ/ISD). 2008. *Industrial Siting News.* Available: <http://deq.state.wy.us/isd/isdnews.htm>. Accessed: May 2008.

Wyoming Department of Revenue. 2006. *Annual Report 2006.* Available: <http://revenue.state.wy.us/PortalVBVS/DesktopDefault.aspx?tabindex=3&ta bid=10>.

_____. 2007. *Aggregated Sales and Use Tax Report for Fiscal Year: 2007.* Cheyenne, WY. Available: <http://revenue.state.wy.us>. Accessed: April 10, 2007.

———. 2008. *Annual Report 2008.* Cheyenne, Wyoming. Available: <http://revenue.state.wy.us/PortalVBVS/uploads/2008%20DOR%20Annual%20Report.pdf>. Accessed: March 30, 2009.

Wyoming Department of Transportation and Foundation Coal Company. 2008. *Background Information and Other Materials Presented at a Public Open House and Information Meeting on the Proposed Location of U.S. Highway 14-16 North of Gillette.*

Wyoming Game and Fish Department. 2006. *Wyoming Sage-GROUSE Definitions.* December 8. Available from the Wyoming Game and Fish Department, Cheyenne, WY.

———. 2008a. *Casper and Sheridan Region 2007 Annual Big Game Herd Unit Report.*

———. 2008b. *Northeast Wyoming Working Group 2007 Annual Sage-grouse Completion Report.* Buffalo, WY. Available: <http://gf.state.wy.us/wildlife/wildlife_management/sagegrouse/pdf/2007sgjcrsbyregion/2007NortheastJCR.pdf>.

———. 2008c. *Statewide 2007 Annual Sage-grouse Completion Report.* Cheyenne, WY. Available: <http://gf.state.wy.us/wildlife/wildlife_management/sagegrouse/pdf/2007sgjcrsbyregion/2007StatewideJCR.pdf>.

Wyoming Housing Database Partnership. 2007. *The 2007 Wyoming Housing Needs Forecast – Final Report.* Available: <http://www.wyomingcda.com/Homebuyer/Home_Demographics.html>.

_____. 2008. *A Profile of Wyoming Demographics, Economics and Housing, Semi-Annual Report, Ending December 31, 2007.* Available: <www.wyomingcda.com/files/Profile07b_Vol_I_FNL.pdf>. Accessed: April 10, 2008.

Wyoming Mining Association. 2006. *Wyoming Bentonite Page.* Available: <http://www.wmaminelife.com/bent/bentmine.htm>.

———. 2009. *Wyoming Coal.* Available: <http://www.wma-minelife.com/coal/coalhome.html>. Accessed: May 2009.

Wyoming Oil and Gas Conservation Commission. 2004. *Wyoming Statistics.* Available: <http://WOGCC.state.wy.us/cfdocs/2002stats.html>.

———. 2005. *Rules and Statutes.* Available: <http://wogcc.state.wy.us>. Accessed: March 2005.

———. 2007. *Oil and Gas Well Information.* Updated daily. Available: <http://wogc.state.wy.us>. Accessed: November 20, 2007.

———. 2008. *Oil and Gas Well Information.* Updated daily. Available: <http://wogcc.state.wy.us>. Accessed: May 11, 2008.

———. 2009. *Oil and Gas Well Information.* Updated daily. Available: <http://wogcc.state.wy.us>. Accessed: May 2009.

Wyoming Pipeline Authority. 2008. *Projects.* Available: <http://www.wy.wyopipeline.com/projects.asp>. Accessed: May 2008.

Wyoming School Facilities Commission. 2007. *2007–2008 Biennium Budget Request and Approved Five Year Plans.* Available: <http://sfc.state.wy.us/DMPInfo.aspx>. Accessed: November 2007.

———. 2008. *2009-2010 Prioritized Projects List and 5-Year Plan.* Available: <http://sfc.state.wy.us/index.aspx>. Accessed: May 2008.

Wyoming State BLM Office–Reservoir Management Group (WSO-RMG). 2005. *Review of Coalbed Natural Gas and Conventional Oil and Gas Reservoirs, Production and Economy, Eagle Butte LBA EIS, Powder River Basin, Wyoming.* Unpublished report. September.

———. 2006. *Review of Coalbed Natural Gas Resources, Production, and Economics, Powder River Basin, Wyoming.* Unpublished internal report. May.

Wyoming State Board of Equalization. 2007. *Wyoming Abstract & Mill Levy Report, 2006.* Available: <http://tasappeals.state.wy.us/s26abs1valueonly.htm>.

Wyoming State Board of Equalization. 2008. *Wyoming Abstract and Mill Levy Report, 2008.* Available: <http://taxappeals.state.wy.us/2008%20Annual%20Report.xls>. Accessed: March 30, 2009.

Wyoming State Geological Survey. 2002. *Wyoming Geo-Notes*, No. 73, April, 44 pp.

_____. 2003. *Wyoming Geo-Notes,* No. 78, November, 47 pp.

———. 2004. *Digital Industrial Minerals and Construction Materials Map of Wyoming, by R.E. Harris.* WSGS Map Series MS-47.

———. 2009. *Uranium Production in Wyoming.* Available: <http://www.wsgs.uwyo.edu/WSGSgroups/Uranium/Default.aspx>. Accessed: December 2009.

Wyoming State Inspector of Mines. 2007. *Annual Report for the Year Ending December 31, 2007.*

Wyoming Travel and Tourism Division. 2007. *Wyoming Official Travel Web Site—Places to Stay, by Town. Cheyenne, Wyoming.* Available: <http://www.wyomingtourism.org>. Accessed: April 13, 2008.

6.2. Personal Communication

Ackermann, Laura, Permit Coordinator. Buckskin Mine Environmental Affairs Office, Gillette, WY. April 2008—e-mail and telephone call with R. Dutton, Principal, Sammons/Dutton LLC.

Anderson, Steve, Building Official and Zoning Administrator. Campbell County Building and Planning Office, Gillette, WY. May 15, 2008—telephone interview by Aqua Terra Consultants, Inc.

Bigelow, S., Executive Director. Campbell County Economic Development Corporation, Gillette, WY. July 9, 2004—communication with D. Blankenship, Blankenship Consulting, LLC.

Boger, William. Belle Ayr Mine, now Alpha Natural Resources. August 7, 2009—letter to Mike Karbs of the BLM High Plains District Office, Casper, WY.

Chancellor, Rick, Director. Wyoming Department of Environmental Quality, Cheyenne State Office, Cheyenne, WY. June 16, 2003—communication with Nancy Doelger, BLM, Casper Field Office.

Christensen, R.. Wyoming Department of Environmental Quality/Land Quality Division, Cheyenne, WY. July 31, 2002—communication with C. Florian, Greystone Environmental Consultants regarding summary report of coal permit totals to date: Active Coal Mine Permits, Powder River Basin, 1999–2001.

DeBruyn, Roland. LUCA Technologies Inc, Golden, CO. August 19, 2009— telephone conversation and email exchanges with Teresa Johnson, BLM, Casper Field Office.

Emme, Doug. Blasting Program Principal. Wyoming Department of Environmental Quality. May 7, 2003.

Hanson, Dale. Regional Paleontologist. Bureau of Land Management, Wyoming State Office, Cheyenne, WY. July 15, 2008—telephone conversation with Rose Difley.

Jahnke, L., Wildlife Management Coordinator, Wyoming Game and Fish Department, Sheridan, WY. May 20, 2005—email communication with WWC Engineering.

Langston, Tom, Director. Gillette Department of Community Development, Gillette, WY. 2005—telephone conversation with R. Dutton, Sammons/Dutton LLC.

O'Brien, Heather, District Wildlife Biologist. Wyoming Game and Fish Department, Gillette, WY. May 5, 2008—telephone interview by Aqua Terra Consultants, Inc.

Petersen, Steve, Assistant City Engineer. City of Gillette Engineering Department, Gillette, WY. April 20, 2007—telephone conversation with G. Blankenship, Blankenship Consulting LLC.

Shamley, J., Senior Engineering Analyst. Wyoming Department of Environmental Quality/Air Quality Division, District 3. April 24 and May 3, 2008—communications with J. Berry, WWC Engineering.

Shorma, G., Regional Supervisor. Wyoming Game and Fish Department, Sheridan, WY. May 20, 2005—communication with B. Strom, ENSR.

Spencer, D.R., Northeast Region Director. Wyoming Business Council. April and July 2004—communication with G. Blankenship, Blankenship Consulting, LLC.

Stratham, A., Wyoming Game and Fish Department. May 12, 2005—communication with B. Strom, ENSR.

Unknown, staff member. Wyoming Department of Education, Cheyenne, WY. April 2008—telephone conversation with Ron Dutton, Sammons/Dutton LLC, regarding fall 2007 enrollment counts.

Williams, M., CEO, Interline Resources. June 9, 2008—communication with R. Dutton, Sammons/Dutton LLC.

Wyoming Oil and Gas Conservation Commission. April 14, 2005—communication with W. Berg, ENSR, regarding Application for Permit to Drill approvals.

7.0 GLOSSARY

aboriginal – Related to early or primitive cultures in a region. Being the first or earliest known of its kind in a specific region.

ad valorem tax – A tax paid as a percentage of the assessed value of property.

adverse impact – An apparent direct or indirect detrimental effect.

air stagnation event – When air is trapped by poor ventilation due to persistent light or calm winds, and by the presence of inversions.

aliquot – An exact portion.

alkalinity – The degree to which the pH of a substance is greater than 7 (on a scale of 1 to 14).

alluvial deposit – Deposits of clay, silt, sand, gravel, and/or other materials carried by moving surface water, such as streams, and deposited at points of weak water flow; alluvium.

alluvial valley floor (AVF) – An area of unconsolidated stream-laid deposits holding streams with water availability sufficient for subirrigation or flood irrigation agricultural activities (see 30 CFR 701.5).

alluvium – Sorted or semi-sorted sediment consisting of clay, silt, sand, gravel, or other unconsolidated rock material deposited in comparatively recent geologic time by a stream or other body of running water in the bed of that stream or on its floodplain or delta.

alternative – In terms of the National Environmental Policy Act, one of several substitute or alternate proposals that a federal agency is considering in an environmental analysis.

ambient – Surrounding conditions (or environment) in a given place and time.

annual precipitation – The quantity of water that falls yearly in the form of rain, hail, sleet, and snow.

approximate original contour – Postmining surface configuration achieved by backfilling and grading of mined-out areas so that the reclaimed land surface resembles the general surface configuration of the land prior to mining (see 30 CFR 701.5).

aquatic – Living or growing in or on the water.

aquifer – A layer of permeable rock, sand, or gravel that stores and transmits water in sufficient quantities for a specific use.

aquitard – A confining bed that retards but does not totally prevent the flow of water to or from an adjacent aquifer; a leaky confining bed.

area source – A plant site that does not emit any single HAP (Hazardous Air Pollutant) at a rate of 10 tons or greater per year, or any combination of HAPs at a rate of 25 tons or greater per year.

arithmetic mean – The sum of the values of n numbers divided by n. It is usually referred to as simply the "mean" or "average".

ash – The residual non-combustible matter in coal that comes from included silt, clay, silica, or other substances. The lower the ash content, the better the quality of the coal.

avian – Of, relating to, or derived from birds.

backfill – The operation of refilling an excavation. Also, the material placed in an excavation when it is refilled.

baseline – Conditions, including trends, existing in the human environment before a proposed action is begun; a benchmark state from which the environmental consequences of an action are forecast; the no-action alternative.

beneficial impact – An apparent direct or indirect advantageous effect.

bentonite – A clay formed by the decomposition of volcanic ash which has the ability to absorb large amounts of water and to expand to several times its normal volume; used in adhesives, cements and ceramic fillers.

BLM study area – The area, encompassing the proposed tract and adjacent unleased federal coal reserves identified by the BLM, from which coal would be mined under Alternative 2.

bonus – That value in excess of the rentals and royalties that is paid to the United States as part of the consideration for receiving a lease for publicly owned minerals (see 43 CFR 3400.0-5(c)).

braided stream – A stream flowing in several dividing and reuniting channels resembling the strands of a braid.

buffer zone – An area between two different land uses that is intended to resist, absorb, or otherwise preclude development or intrusion between the two use areas.

bypass coal – An isolated part of a coal deposit that is not leased and that can only be economically mined in an environmentally sound manner as a part of continued mining by an existing adjacent operation (see 43 CFR 3400.0.5(d)).

clinker (scoria) – Baked and fused rock resulting from in-place burning of coal deposits.

coal bed natural gas (CBNG) – Natural gas (methane) that is generated during the coal-forming process.

coal combustion products (CCPs) – the materials produced primarily from the combustion of coal in coal-fired power plants.

colluvium – Rock fragments, sand, or soil material that accumulates at the base of slopes; slope wash.

confluence – The point at which two or more streams meet.

conglomerate – A rock that contains rounded rock fragments or pebbles cemented together by another mineral substance.

contiguous – Lands or legal subdivisions having a common boundary point.

cooperating agency – An agency which has jurisdiction by law in an action being analyzed in an environmental document and who is requested to participate in the NEPA process by the agency that is responsible for preparing the environmental document (see 40 CFR 1501.6 and 1508.5).

crucial wildlife habitat – Parts of the habitat necessary to sustain a wildlife population during periods of their life cycle. It may be a limiting factor on the population, such as nesting habitat or winter habitat.

cultural resources – The remains of human activity, occupation, or endeavor reflected in districts, sites, structures, buildings, objects, artifacts, ruins, works of art, architecture, and natural features that reveal the nature of historic and prehistoric human events. These resources consist of (1) physical remains, (2) areas where significant human events occurred, and (3) the environment immediately surrounding the resource.

cumulative impact – The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

decertification process – During the 1970s and early 1980s, the PRB emerged as a major coal production region, and coal leasing in the PRB operated as a certified federal coal production region during that period. Under this process, coal leases were sold in parcels of sufficient size to open a new mine or make significant contributions to expanding existing mine operations, as described under 43 CFR 3420. Leasing was developed through this regional process through the 1980s.

In 1982, the BLM temporarily halted coal leasing in the PRB. However, the existing mines continued producing coal, which depleted their leased federal coal reserves. As a result, interest in leasing federal coal to extend mining operations at existing mines in the PRB increased in the late 1980s, but little to no interest in a regional sale to obtain sufficient reserves to open new mines was expressed during that period. The PRB had reached a point where sufficient mining operations had been established to meet expected coal demand.

This "maintenance" lease approach by the operators resulted in an insufficient interest in coal leasing to justify a continued regional leasing approach. In 1990, based on the advice of the Powder River Regional Coal Team (PRRCT), the BLM decertified the region for coal leasing. That decertification process allowed the BLM to begin processing applications by existing mines to lease smaller, individual maintenance tracts of federal coal using the lease by application (LBA) process under the rules of 43 CFR 3425. Many of the federal coal production regions

were decertified in the later 1980s, in large part because of a decline of interest in leasing federal coal throughout the country.

decibel – A unit of sound measurement. In general, a sound doubles in loudness for every increase of 10 decibels.

deciview (dv) – A general measure of view impairment (13 deciview equals a view of approximately 60 miles) caused by pollution. A 10% change in extinction corresponds to 1.0 dv.

Desorb/desorption – A phenomenon whereby a substance is released from or through a surface.

dip – The angle at which a rock layer is inclined from the horizontal.

direct (or primary) impact – An impact caused by an action that occurs at the same time and place as the action (see 40 CFR 1508.8).

discharge – Any of the ways that ground water comes out of the surface, including through springs, creeks, or being pumped from a well.

dissected upland – An upland or high area in which a large part of the original surface has been deeply cut into by streams.

Dragline – A type of excavating crane that consists of a large bucket and cable ropes suspended out over a long boom arm. The bucket of this apparatus collects the targeted material by pulling the bucket toward itself on the ground with a second rope or cable, elevates the bucket, and dumps the material either on a backfill bank, pile or various mode of transport such as a transport truck. A dragline operation is typically used to remove over burden above coal or for tar-sand mining.

drawdown – The reduction in groundwater quantity in the aquifers as a result of seepage into and dewatering from mine excavations.

eolian/aeolian deposit – Sand and other loose materials carried, formed, or deposited by the wind.

ephemeral stream – A stream or portion thereof that flows occasionally because of surface runoff, and is influence nominally by natural springs and is not influenced by continuous permanent ground water flow from snow melt or other sources.

erosion – The wearing away of the land surface by running water, wind, ice or other geologic agents.

evapotranspiration – The sum total of water lost from the land by evaporation and plant transpiration.

excavation (archeological) – The scientifically controlled recovery of subsurface materials and information from a cultural site. Recovery techniques are relevant to research problems and are designed to produce maximum knowledge about the site's use, its relation to other sites and the natural environment, and its significance in the maintenance of the cultural system.

fair market value – The amount in cash, or terms reasonably equivalent to cash, for which a coal deposit would be sold or leased by a willing seller to a willing buyer.

fixed carbon – In coal, the solid combustible material remaining after removal of moisture, ash, and volatile matter. It is expressed as a percentage.

floodplain – The relatively flat area or lowland adjoining a body of flowing water, such as a river or stream that is covered with water when the river or stream overflows its banks.

forage – Vegetation used for food by wildlife, particularly big game wildlife, and domestic livestock.

formation (geologic) – A rock body distinguishable from other rock bodies and useful for mapping or description. Formations may be combined into groups or subdivided into members.

fossil – The remains or traces of an organism or assemblage of organisms that have been preserved by natural processes in the earth's crust. Many minerals that may be of biologic origin that are not considered to be fossils (e.g., oil, gas, asphalt, limestone).

fugitive dust – Small particles that become airborne as a result of natural factors (i.e., wind blowing across unvegetated areas) or in response to surface disturbance (e.g., vehicles, wildlife and livestock movements).

general analysis area – The BLM study area and a 0.25-mile-wide buffer to the north and west, a total of approximately 2,847.3 acres. This area represents the maximum surface area that could be disturbed by the alternatives analyzed in this EIS.

geometric mean – The nth root of the product of the values of n positive numbers.

ground water – Subsurface water that fills available openings in rock or soil materials to the extent that they are considered water saturated.

habitat – A place where a plant or animal naturally or normally lives and grows.

habituation – The process of becoming accustomed to, or used to, something; acclimation similar to acclimation.

hazardous materials – Substance which, because of its potential for corrosivity, toxicity, ignitability, chemical reactivity, or explosiveness, may cause injury to persons, damage to property or the environment.

hazardous waste – Those materials defined in Section 101 (14) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, and listed in 40 CFR 261.

heterogenous – Made up of dissimilar constituents.

human environment – The natural and physical environment and the relationship of people with that environment (see 30 CFR 1508.14).

hydraulic conductivity – The capacity of a medium to transmit water when a hydraulic gradient is present; permeability coefficient. Expressed as the volume of water at the prevailing temperature that will move in unit time under a unit hydraulic gradient through a unit area. Units include gallons per day per square foot, centimeters per second.

hydraulic – Pertaining to fluid in motion, or to movement or action caused by water.

hydric soil – A soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic (water-loving) vegetation. Hydric soils that occur in areas having positive indicators of hydrophytic vegetation and wetland hydrology are wetland soils.

hydrocarbon – Any organic compound, gaseous, liquid, or solid, consisting solely of carbon and hydrogen.

hydrogeology – The science that deals with movement and disturbance of any groundwater along with its interaction with the soil and rocks of the earth's crust.

hydrology – The science dealing with the behavior of water as it occurs in the atmosphere, on the surface of the ground, and underground.

hydrophytic vegetation – The plant life growing in water or on an area of soil that is frequently inundated or saturated with moisture (i.e., water). This area periodically is deficient in oxygen as a result of the excessive moisture content of the soil. When hydrophytic vegetation comprises a community where indicators of hydric soils and wetland hydrology also occur, the area has wetland characteristics.

impermeable – Not capable of transmitting fluids or gasses in appreciable quantities.

incised – Having a margin that is deeply and sharply notched/cut.

indirect (or secondary) impact – A reasonably foreseeable impact resulting from an action but occurring later in time than or removed in distance from that action (see 40 CFR 1508.8).

in-place coal reserves – The estimated volume of all of the coal reserves in a lease without considering economic or technological factors that might restrict mining.

in-situ leach mining – Removal of the valuable components of a mineral deposit through chemical leaching without physical extraction of the rock.

interbedded – Layers of one type of rock, typically thin, that are laid between or that alternate with layers of another type of rock.

interburden – A layer of sedimentary rock that separates two mineable coal beds.

interdisciplinary – Characterized by participation or cooperation among two or more disciplines or fields of study.

intermittent stream – A stream that does not flow year-round but has some association with ground water for surface or subsurface flow.

laminated – Consolidated or unconsolidated sediment that is characterized by thin (less than 1 centimeter thick) layers.

land and resource management plan (LRMP) – A land use plan that directs the use and allocation of USDA Forest Service lands and resources.

lead agency – The agency or agencies preparing or having taken primary responsibility for preparing an environmental document (see 40 CFR 1508.16).

lease (mineral) – A legal document executed between a mineral owner or lessor and another party or lessee which grants the lessee the right to extract minerals from the tract of land for which the lease has been obtained (see 43 CFR 3400.0-5(r)).

lek – A traditional breeding area in or adjacent to sagebrush dominated habitat where five or more males engage in competitive mating displays of strutting to obtain a mate for the purpose of breeding.

lek complex – A grouping of individual leks that are in close proximity to each other that the male sage-grouse may move between on a daily basis. At the present time a criteria to determine the distance between leks within a lek complex does not exist.

lek count – A lek count is a way of documenting the actual number of breeding male-grouse within a particular lek or lek complex. The criteria to conduct a lek count are available from the WGFD.

lek survey – Lek surveys are conducted when a lek count is infeasible to complete do to location or weather deterrents. Lek surveys are not nearly as thorough as lek counts and can be done via a plane or helicopter when time, weather and or terrain prohibits a comprehensive lek count. Lek surveys do not take exact count of the number of grouse within a lek but are meant as an overall snapshot of a lek or lek complex to determine if a lek is active or inactive as well as to monitor the population and to see if a lek count is needed. This survey can require as little as one visit to a suspected lek. Lek surveys are conducted from early March to early to mid May based on terrain and weather.

lek annual status – Lek annual status is determined by the following:

- **active** – Any lek where there have been male grouse seen strutting or there are recent signs of strutting by male sage-grouse during the mating season.

- **inactive** – There are insufficient indicators of a site being used by grouse during the strutting season. A minimum of two surveys separated by seven days need to be completed in optimum strutting conditions. The results of the survey must be devoid of any evidence of strutting in other words no birds, droppings, feathers or scratch marks can be present. The survey to determine that a lek is inactive cannot be completed aerially.
- **unknown** – Where the status of a lek has not been determined/documented during a strutting season as active or inactive.
- **management status** – The management status is determined based on what the annual status is determined to be, once the management status is determined a lek is placed in one of the following categories for management.
- **occupied lek** – As stated by the WDEQ and USFWS an occupied lek is "a lek that has been active during at least one strutting season within the prior ten years. Occupied leks are protected through prescribed management actions during surface disturbing activities."
- **unoccupied lek**- An unoccupied lek falls under one of the following and are not protected during any surface disturbing activities.
  - **destroyed lek** – A destroyed lek is an area that had once been an active lek site including appropriate habitat that is no longer suitable for sage-grouse breeding. A destroyed lek area is not monitored unless the site has been reclaimed and the habitat is considered once again considered suitable for sage-grouse mating.
  - **abandoned lek** –An area of habitat that would be considered appropriate habitat for breeding but has not see any measurable activity for a period of 10 consecutive years. During the 10 consecutive years a lek has to be considered "inactive" for a minimum of four non- consecutive strutting seasons. The area in which a lek is labeled as abandoned must be surveyed a minimum of once every ten years to maintain the abandoned lek status and to ensure that no new grouse activity has begun.
  - **undetermined lek** – An undetermined lek is a lek in which there is insufficient data over the preceding 10 years to determine its actual status as either unoccupied or active. An undetermined lek will be protected as if it is active during all surface disturbance activity or until such time enough data has been compiled to determine its status as inactive.

lenticular – Term describing a body of rock or earth that thins out in all directions from the center like a double convex optical lens.

limb (geologic) – One of the two parts of a fold (syncline or anticline) on either side of an axis.

limestone – A sedimentary rock consisting chiefly of calcium carbonate ($CaCO_3$).

lineament – A linear topographic feature of regional extent that is believed to reflect the hidden architecture of the rock structure below the surface.

loadout facilities – The mine facilities used to load the mined coal for transport out of the mine.

loam – A rich, permeable soil composed of a mixture of clay, silt, sand, and organic matter.

long-term impact – An impact that persists through the time the reclamation bond is released—minimum of 10 years beyond active reclamation.

maintenance tract – A federal coal tract that would continue or extend the life of an existing coal mine.

major federal action – An action with effects that may be major and which is potentially subject to federal control and responsibility (see 40 CFR 1508.18).

major sources – Those sources that emit more than 10 tons per year of any single hazardous air pollutant, or 25 tons of all hazardous air pollutants combined. The determination of major is based on all sources of hazardous air pollutants at the site, and not just the equipment affected by the MACT standard.

maximum economic recovery (MER) – The requirement that, based on standard industry operating practices, all profitable portions of a leased federal coal deposit must be mined. MER determinations will consider existing proven technology; commercially available and economically feasible equipment; coal quality, quantity, and marketability; safety, exploration, operating, processing, and transportation costs; and compliance with applicable laws and regulations (see 43 CFR 3480.0-5(a)(24)).

meteorological – Related to the science dealing with the atmosphere and its phenomena, especially as relating to weather.

methane – A colorless, odorless, and inflammable gas; the simplest hydrocarbon; chemical formula = CH_4. It is the principal constituent of natural gas and is also found associated with crude oil and coal.

mineable coal – Coal that can be economically mined using present day mining technology.

mineral rights – The rights of one who owns the mineral estate (subsurface).

mine-related activities – Activities that occur outside a mine lease including, but not limited to, topsoil stripping, stockpile storage, highwall back-sloping (including catch benches), highwall reduction after mining to match undisturbed topography, and construction of flood- and sediment-control structures.

mining permit – A permit to conduct surface coal mining and reclamation operations issued by the state regulatory authority pursuant to a state program or by the Secretary pursuant to a federal program (see 30 CFR 701.5).

mitigation – An action to avoid, minimize, reduce, eliminate, replace, or rectify the impact of a management practice.

mudstone – A hardened sedimentary rock consisting of clay, silt, siltstone, claystone, shale and argillite. It is similar to shale but lacks distinct layers. This term is also used when there is doubt as to the precise identification of a deposit.

National Register of Historic Places – A list of districts, sites, buildings, structures and objects significant in American history, architecture, archeology and culture maintained by the Secretary of the Interior. Expanded as authorized by Section 2(b) of the Historic Sites Act of 1935 (16 U.S.C. 462) and Section 101(a)(1) (A) of the National Historic Preservation Act.

natural gas – Combustible gases (such as hydrocarbons) or mixtures of combustible gases and non-combustible gases (such as helium) that are in a gaseous phase at atmospheric conditions of temperature and pressure.

NEPA process – All measures necessary for compliance with the National Environmental Policy Act of 1969 (see 40 CFR 1508.21).

No Action Alternative – An alternative where no activity would occur. The development of a no action alternative is required by regulations implementing the National Environmental Policy Act (40 CFR 1502.14). The No Action Alternative provides a baseline for estimating the effects of other alternatives.

operationally limited – Lands around or between those features that are inaccessible for mining within a lease area.

outcrop – A rock formation that appears at or near the surface; the intersection of a rock formation with the surface.

overburden – Material of any nature, consolidated or unconsolidated, that overlies a coal or other useful mineral deposit, excluding topsoil.

overlap area – The area between the general analysis area and existing mine permit boundary; represents the area where activities related to mining existing coal leases would occur.

paleontological resource – A site containing evidence of plant or non-human animal life of past geological periods, usually in the form of fossil remains.

peak discharge or flow – The highest discharge of water recorded over a specified period of time at a given stream location; also called maximum flow. Often thought of in terms of spring snowmelt, summer, fall or winter rainy season flows.

perennial species (vegetation) – Vegetation that lives over from season to season.

perennial stream – A stream or part of a stream that flows continuously during the calendar year as a result of groundwater discharge or surface runoff.

permanent impact – An impact that persists indefinitely.

permeability – The ability of rock or soil to transmit a fluid.

permit application package – A proposal to conduct surface coal mining and reclamation operations on federal lands, including an application for a permit, permit revision, or permit renewal and all the information required by SMCRA, the applicable state program, any applicable cooperative agreement, and all other applicable laws and regulations including, with respect to federal leased coal, the Mineral Leasing Act and its implementing regulations.

permit area – The area of land, indicated on the approved map submitted by the operator with his or her application, required to be covered by the operator's performance bond under the regulations at 30 CFR Part 800 and which shall include the area of land upon which the operator proposes to conduct surface coal mining and reclamation operations under the permit, including all disturbed areas (see 30 CFR 701.5).

physiography – Physical geography the systematic classification and description of natural physical features.

piezometer – A well, generally of small diameter, that is used to measure the elevation of the water table.

playa – The sandy, salty, or mud-caked flat floor of a basin with interior drainage, usually occupied by a shallow ephemeral lake during or after rain or snow storms.

point source (pollution) – A point at which pollution is added to a system, either instantaneously or continuously. An example is a smokestack.

pore volume – The amount of fluid necessary to fill the void space in an unsaturated porus medium (i.e., mine backfill).

porosity – The percentage of the bulk volume of rock, sediment or soil that is not occupied by sediment or soil particles; the void space in rock or sediment. It may be isolated or connected.

postmining topography – The relief and contour of the land that remains after mining has been completed.

potentiometric surface – The surface that coincides with the static level of water in an aquifer. The surface is represented by the levels to which water from a given aquifer will rise under its full hydraulic head.

proposed action – In terms of National Environmental Policy Act, the project, activity, or action that a federal agency proposes to implement or undertake and which is the subject of an environmental analysis.

proposed tract – The proposed tract is a maintenance coal lease adjacent to existing federal coal leases; the proposed tract represents the area from which coal would be mined under the Proposed Action.

qualified surface owner – The natural person or persons (or corporation, the majority stock of which is held by a person or persons otherwise meeting the requirements of this section) who:

1. Hold legal or equitable title to the surface of split estate lands;
2. Have their principal place of residence on the land, or personally conduct farming or ranching operations upon a farm or ranch unit to be affected by surface mining operations; or received directly a significant portion of their income, if any, from such farming and ranching operations; and
3. have met the conditions of (1) and (2) above for a period of at least three years, except for persons who gave written consent less than three years after they met the requirements of both (1) and (2) above (see 43 CFR 3400.0-5(gg)).

raptor – Bird of prey, such as an eagle, falcon, hawk, owl, or vulture.

recharge – The processes by which groundwater is absorbed into a zone of saturation.

reclamation – Rehabilitation of a disturbed area to make it acceptable for designated uses. This normally involves regrading, replacement of topsoil, revegetation and other work necessary to restore the disturbed area for postmining use.

record of decision (ROD) – A document separate from, but associated with, an environmental impact statement that publicly and officially discloses the responsible official's decision on the proposed action (see 40 CFR 1505.2).

recoverable coal – The amount of coal that can actually be recovered for sale from the demonstrated coal reserve base.

recreational river areas – Rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

rental payment – Annual payment from a lessee to a lessor to maintain the lessee's mineral lease rights.

resource management plan (RMP) – A land use plan, as prescribed by FLPMA, that directs the use and allocation of public lands and resources managed by BLM. Prior to selection of the RMP, different alternative management plans are compared and evaluated in an environmental impact statement (EIS) to determine which plan will best direct the management of the public lands and resources.

revegetation – The reestablishment and development of self-sustaining plant cover following land disturbance. This may occur through natural processes, or the natural processes may be enhanced by human assistance through seedbed preparation, reseeding, and mulching.

right-of-way – The right to pass over property owned by another. The strip of land over which facilities such as roadways, railroads, or power lines are built.

riparian – The area adjacent to rivers and streams that lies between the stream channel and upland terrain and that supports specific vegetation influenced by perennial and/or intermittent water.

royalty (mineral) – A share of production that is free of the expense of production. It is generally paid by a lessee to a lessor of a mineral lease as part of the terms of the lease.

runoff – That portion of rainfall that is not absorbed; it may be used by vegetation, lost by evaporation, or it may find its way into streams as surface flow.

salinity – Refers to the solids, such as sodium chloride (table salt) and alkali metals, that are dissolved in water. Often in non-saltwater areas, total dissolved solids is used as an equivalent term.

sandstone – A common sedimentary rock primarily composed of sand grains, mainly quartz, that are cemented together by other mineral material.

scoping – A public informational process required by the National Environmental Policy Act to determine private and public concerns, scope of issues, and/or questions regarding a proposed action to be evaluated in an environmental impact analysis.

scoria (clinker) – Baked and fused rock resulting from in-place burning of coal deposits.

sedimentation pond – An impoundment used to remove solids from water in order to meet water quality standards or effluent limitations before the water leaves the permit area (see 30 CFR 701.5).

selenosis – Selenium poisoning; chronic (long-term) exposure to high levels of selenium in food and water.

semi-arid – A climate or region characterized by little yearly rainfall and by the growth of a number of short grasses and shrubs.

severance tax – A tax imposed by the government on the extraction of minerals and other natural resources from the ground.

shale – A very fine-grained clastic rock or sediment consisting predominately of clay-sized particles that is laminated; lithified, layered mud.

short-term impact – An impact associated with operations, persisting during active mining and reclamation.

significant impact – A qualitative term used to describe the anticipated importance of impacts to the human environment as a result of an action.

siltstone – A fine-grained clastic rock consisting predominately of silt-sized particles.

slope wash – A general term to refer to colluvium found along the bottom slopes of hills and in channel bottoms as a result of soil erosion and the down-slope movement of sediment; reworked sediment deposited by flow over the ground surface (e.g., runoff).

socioeconomics – The social and economic situation that might be affected by a proposed action.

soil survey – The systematic examination, description, classification, and mapping of soils in an area, usually a county. Soil surveys are classified according to the level of detail of field examination. Order I is the most detailed and Order V is the least detailed.

spontaneous combustion – The heating and slow combustion of coal and coaly material initiated by the absorption of oxygen.

stipulations – Requirements that are part of the terms of a mineral lease. Some stipulations are standard on all Federal leases. Other stipulations may be applied to specific leases at the discretion of the surface management agency to protect valuable surface resources or uses existing on those leases.

storage coefficient – The volume of water that can be released from storage per unit surface area of a saturated confined aquifer, per unit decline in the component of hydraulic head normal to the surface. It is calculated by taking the product of the specific storage and the aquifer thickness.

stratigraphic – Of, relating to, or determined by stratigraphy, which is the branch of geology dealing with the study of the nature, distribution, and relations of layered rocks in the earth's crust.

stream-laid deposits – A loose mix of sand, gravel, and silt deposited by stream flow within a stream channel.

stripping ratio – The unit amount of overburden that must be removed to gain access to a similar unit amount of coal.

subirrigation – In alluvial valley floors, the supplying of water to plants from underneath, or from a semi-saturated or saturated subsurface zone where water is available for use by vegetation (see 30 CFR 701.5).

subbituminous – A lower rank of coal (35–45% carbon) with a heating value between that of bituminous and lignite, usually 8,300–11,500 Btu per pound. Subbituminous coal contains a high percentage of volatile matter and moisture.

support area – A 0.25-mile-wide area north and west of the proposed tract and of the BLM study area, where activities necessary for coal mining (e.g., topsoil stripping) would occur; no coal extraction would occur in the support areas.

surface disturbance – Any disturbance by mechanical actions that alters the soil surface.

surface rights – Rights to the surface of the land, does not include rights to oil, gas, or other subsurface minerals or subsurface rights.

suspended solids – The very fine soil particles that remain in suspension in water for a considerable period of time without contact with the stream or river channel bottom.

tectonic fracture – Fractures caused by deformation of the earth's crust.

threatened and endangered species – These species of plants or animals classified as threatened or endangered pursuant to Section 4 of the Endangered Species Act. Any species that is in danger of extinction, or is likely to become so within the foreseeable future.

- Category 1 – Substantial biological information on file to support the appropriateness of proposing to list as endangered or threatened.
- Category 2 – Current information indicates that proposing to list as endangered or threatened is possibly appropriate, but substantial biological information is not on file to support an immediate ruling (USFWS).

topography – Physical shape of the ground surface; the configuration of land surface including its relief, elevation, and the position of its natural and manmade features.

topsoil – The surface layer of a soil, generally the top 2–6 inches and generally having more organic material and nutrients.

total dissolved solids (TDS) – The total quantity in milligrams per liter of dissolved materials in water.

transmissivity – The rate at which water is transmitted through a unit width of an aquifer under a unit hydraulic gradient. Equals the hydraulic conductivity multiplied by the aquifer thickness. Values are given in units of gallons per day per foot.

transpiration – The discharge of water vapor by plants.

truck & shovel – A mining method used to remove overburden and coal in a strip mining operation. Truck and shovel operations use large bucket-equipped digging and loading machines (shovels) and large dump trucks to remove overburden instead of using a dragline for overburden removal.

typic – Typical.

unconfined aquifer – An aquifer where the water table is exposed to the atmosphere through openings in the overlying materials.

unsuitability criteria – The 20 criteria described in 43 CFR 3461, the application of which results in an assessment of federal coal lands as suitable or unsuitable for surface coal mining.

uranium – A very hard, heavy, metallic element that is crucial to development of atomic energy.

vegetation type – A kind of existing plant community with distinguishable characteristics described in terms of the present vegetation that dominates an area.

vertebrate fossils – The remains of animals that possessed a backbone; examples are fish, amphibians, reptiles, dinosaurs, birds, and mammals.

vesicular – Rock containing many small cavities that were formed by the expansion of a bubble of gas or steam during the solidification of the rock.

visual resources – The physical features of a landscape that can be seen (e.g., land, water, vegetation, structures, and other features).

Visual Resource Management (VRM) – The systematic means to identify visual values, establish objectives which provide the standards for managing those values, and evaluate the visual impacts of proposed projects to ensure that objectives are met.

volatile matter – In coal, those substances, other than moisture, that are given off as gas or vapor during combustion.

waterfowl – A bird that frequents water, especially a swimming bird.

wetlands – Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient, under normal circumstances, to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands include marshes, bogs, sloughs, potholes, river overflows, mud flats, wet meadows, seeps, and springs (see 33 CFR 328.3(a)(7)(b)).

wild and scenic river – Rivers or sections of rivers designated by Congressional actions under the 1968 Wild and Scenic Rivers Act as wild, scenic, or recreational by an act of the Legislature of the state or states through which they flow. Wild and scenic rivers may be classified and administered under one or more of the following categories:

- **wild river areas** – Rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.
- **scenic river areas** – Rivers or sections of rivers that are free of impoundments, with watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

wilderness – An area of undeveloped Federal land designated wilderness by Congress, retaining its primeval character and influence, without permanent improvements or human habitation, protected and managed to preserve its natural conditions and that (1) generally appears to have been affected primarily by the forces of nature with the imprint of man's work substantially unnoticeable, (2) has outstanding opportunities for solitude or primitive and unconfined recreation, (3) has at least 5,000 acres or is of sufficient size to make practical its preservation and use in an unimpaired condition, and (4) also may contain features that are of ecological, geological, scientific, educational, scenic, or historical value. These characteristics were identified by Congress in the Wilderness Act of 1964.

winter concentration area – Areas of winter habitat consistently used by sage-grouse. The determination of a winter concentration area is based on repeated observations of an area including the number of sage-grouse (typically 25 or more) and the quantity/quality of winter habitat characteristic. Coordination with the WGFD is necessary prior to any area being listed as a winter concentration area.

winter habitat – Areas where the sagebrush consistently provides forage (leaves and buds) for sage-grouse under any winter conditions. Sagebrush stands in this habitat are either tall enough (at least 10 to 14 inches) to maintain some branches above snow level, or they are located in windblown areas that are not regularly buried or drifted over by snow.

8.0 INDEX OF KEY WORDS

air quality
ES-12, ES-20–21, ES-24, ES-38, ES-40, ES-42
1-1, 1-10, 1-11, 1-13, 1-24
2-6, 2-13, 2-16
3-1, 3-9, 3-31, 3-42–3-47, 3-49–50, 3-53, 3-54, 3-60, 3-62, 3-63, 3-66–67, 3-69–71, 3-73–75, 3-78, 3-81, 3-215, 3-217–219, 3-222
4-1–2, 4-4, 4-13, 4-15, 4-37, 4-41–45, 4-47, 4-50, 4-52, 4-144
Appendix A: A-1
Appendix D: D-19–20, D-22, D-32, D-61–62, D-66, D-108, D-110–114
Appendix G (Air Quality), Appendix G, Attachment A

blasting
ES-18, ES-20–21, ES-24, ES-34
1-13, 1-24
2-7, 2-17
3-10, 3-26, 3-32, 3-41, 3-44, 3-57, 3-60, 3-63–66, 3-68–70, 3-77, 3-80, 3-120, 3-219, 3-222
4-38, 4-65, 4-142
Appendix D: D-19
Appendix G: G-8, G-11–14
Appendix G, Attachment A: 2, 4
Appendix J: J-12

bond release
1-14, 1-15, 1-16
2-7, 2-18
3-110, 3-118, 3-169
4-6, 4-81
Appendix D: D-4–5, D-35, D-63–64

bonus bid payment/bonus payment
ES-11
1-6, 1-19
2-14, 2-21
3-167, 3-198–199, 3-201, 3-203
4-116–117

coal bed natural gas (CBNG)
ES-9, ES-12, ES-19–20, ES-27, ES-33–34,ES-39, ES-43
1-11, 1-22, 1-24
2-14, 2-15
3-9, 3-16, 3-28, 3-33–38, 3-44, 3-61–62, 3-84–85, 3-88, 3-90, 3-92, 3-94, 3-101, 3-103–105, 3-111, 3-114, 3-120, 3-153, 3-155–157, 3-162, 3-166–167, 3-169, 3-174, 3-179, 3-184–185, 3-192, 3-216, 3-220, 3-223, 3-225
4-1, 4-4, 4-16, 4-18, 4-20–25, 4-37–41, 4-33, 4-45, 4-52–58, 4-61–79, 4-81–82, 4-85–89, 4-91, 4-95, 4-102–105, 4-115–117, 4-119, 4-131, 4-145–47
Appendix D: D-67–68, D-107
Appendix F: F-1
Appendix G: G-8, G-10, G-11
Appendix H: all
Appendix J: J-11–12, J-18–20, J-35–36

decertification
ES-38
1-3, 1-6
4-4, 4-6
7-3
Appendix D: D-3, D-114–115

Environmental Protection Agency (EPA)
ES-5, ES-21, ES-24, ES-38, ES-40
1-1, 1-17, 1-25
2-16, 2-19
3-43, 3-45–46, 3-53, 3-61–67, 3-71–73, 3-75, 3-78, 3-101, 3-185, 3-215, 3-219, 3-221–225
4-42–45, 4-52, 4-120–121, 4-126, 4-130–133, 4-138–143
Appendix D: D-19–20, D-22, D-30, D-61–62, D-108–109, D-111–114
Appendix G: G-1–4, G-7, G-12, G-14
Appendix G, Attachment A: 4, 7, 11

fair market value
ES-4
1-6, 1-25
2-1, 2-6, 2-11, 2-14
3-167
Appendix D: D-3, D-30

fugitive dust
ES-20, ES-21
1-11
3-44, 3-61
4-42, 4-99
Appendix D: D-19, D-111
Appendix G: G-6, G-11;
Appendix G, Attachment A: A-11, A-14

grazing
ES-24, ES-25, ES-28
1-11, 1-15
2-18
3-12, 3-14, 3-98, 3-107–108, 3-150, 3-156–157, 3-159–202
4-6, 4-77–80
Appendix I: I-13, I-16, I-19, I-20

greenhouse gas (GHG)
ES-36–37
1-25
3-64, 3-220–225
4-18, 4-41, 4-120–124, 4-126–127, 4-129–136, 4-138, 4-142–143
Appendix D: D-6–8, D-60, D-65–67, D107–109

hazardous
ES-12, ES-36
1-16, 1-17
2-19
3-2, 3-18, 3-196–197, 3-210, 3-218, 3-220
4-52, 4-139
Appendix A: A-1
Appendix G: G-6

human health
1-24
3-9–10, 3-57, 3-60, 3-68, 3-213, 3-215, 3-218
4-138–142
Appendix D: D-61
Appendix G: G-2, G-12

hunting
ES-37
3-129, 3-155–156, 3-158–159, 3-203
4-78, 4-80–81

migratory birds
3-129, 3-139, 3-148
Appendix I: I-5

mining plan
ES-4, ES-6, ES-10
1-1, 1-20
2-2, 2-6, 2-13, 2-15, 2-16, 2-19
3-38, 3-104, 3-161, 3-174, 3-177, 3-217, 3-221
4-119
Appendix A: A-1
Appendix D: D-32
Appendix J: J-5–6, J-12

mitigation
ES-1, ES-4, ES-10, ES-13, ES-20, ES-21, ES-32, ES-33, ES-37,
1-1, 1-20, 1-24
2-2, 2-13, 2-15–20
3-2–3, 3-27–28, 3-33, 3-37, 3-41–42, 3-47, 3-60–62, 3-69, 3-77–78, 3-81, 3-87, 3-92, 3-95, 3-100, 3-106–107, 3-109, 3-117, 3-128–132, 3-140, 3-148, 3-150, 3-155, 3-156, 3-159, 3-161, 3-170, 3-174, 3-177–178, 3-182, 3-188, 3-194, 3-196–197, 3-215, 3-219, 3-224–225
4-40, 4-43, 4-53, 4-64, 4-81, 4-86, 4-90, 4-98, 4-124, 4-130, 4-132
Appendix D: D-6, D-19, D-27, D-61, D-66, D-76, D-108, D-110, D-113
Appendix E: E-1–2
Appendix G: G-6–7
Appendix G, Attachment A: 3, 12
Appendix J: J-5–6, J-20, J-23, J-37

monitoring plan
ES-4, ES-10, ES-13, ES-21, ES-24, ES-27-ES-33, ES-37, ES-44
2-19
3-30
Appendix F: F-1, F-2, F-6, F-8–14
Appendix I: I-5–6, I-12, I-23

nitrogen oxides (NO_x)
ES-21–24, ES-27, ES-38, ES-40, ES-43
3-9–11, 3-19, 3-43–45, 3-53–56, 3-63–72, 3-77–78, 3-80, 3-215, 3-218–219, 3-225
4-42–47, 4-52, 4-138, 4-145
Appendix D: D-19, D-22–23, D-61–63, D-111–113
Appendix G: G-2–4, G-7–8, G-10–13
Appendix G, Attachment A: all

particulates (PM_{10}, $PM_{2.5}$)
ES-20–23, ES-34, ES-38, ES-40
2-12–13, 2-16, 2-19
3-43–47, 3-51–57, 3-60–62, 3-73, 3-77, 3-215, 3-219
4-42–47, 4-52, 4-138, 4-144–145
Appendix D: D-22–23, D-66, D-61, D-110–111, D-113–114
Appendix G: G-2–11
Appendix G, Attachment A: all

power plant
ES-6, ES-21, ES-37, ES-43
1-13, 1-18, 1-24
2-14
3-11, 3-44, 3-66, 3-73, 3-174, 3-194, 3-208, 3-221, 3-224
4-8, 4-13, 4-15–16, 4-18–19, 4-29, 4-38, 4-41–42, 4-52, 4-67, 4-79–80, 4-82, 4-93, 4-99, 4-100–103, 4-110, 4-117–119, 4-121, 4-126, 4-130, 4-133–136, 4-138–143
Appendix D: D-108
Appendix G: G-8, G-11, G-13
Appendix G, Attachment A: 3, 5
Appendix J: J-35, J-36

reclamation plan
ES-1, ES-4, ES-37
1-1, 1-13, 1-15–16, 1-20
2-12–13, 2-16–17, 2-19
3-26–27, 3-87, 3-95, 3-115–116, 3-118, 3-154, 3-156, 3-160, 3-170
4-54, 4-56, 4-79, 4-81
Appendix B: B-2–4, B-32, B-64
Appendix J: J-6, J-37

recreation
ES-10, ES-28, ES-35
3-3, 3-14, 3-66, 3-149, 3-155, 3-156, 3-158, 3-194, 3-203
4-30, 4-43, 4-55–56, 4-77–78, 4-80–81
Appendix B: B-1
Appendix I: I-18, I-21

royalty
ES-6, ES-11
1-6, 1-19
2-14–15, 2-19, 2-21
3-38, 3-198–199, 3-201–202, 3-215
4-1116
Appendix E: E-3–4

sage-grouse
ES-31–33
1-24
2-18
3-15–16, 3-121, 3-133–148, 3-151–155, 3-158, 3-160, 3-217–218
4-89–91, 4-94, 4-148
Appendix B: B-3
Appendix D: D-75
Appendix J: J-5, J-14, J-20–28, J-30–32, J-38–40
Appendix K: K-5, K-7

threatened and endangered species
ES-12, ES-33, ES-43
1-24
2-18
3-1, 3-16, 3-110, 3-117, 3-126, 3-128, 3-140, 3-151–152, 3-158–160, 3-162
4-148
Appendix B: B-2
Appendix D: D-75–76
Appendix E: E-2–3
Appendix J: J-1, J4–7, J-10, J-14–15, J-17, J-22, J-33, J-35–37, J39–40
Appendix K: K-1, K-5, K-9

total dissolved solids (TDS)
3-11, 3-29, 3-83, 3-85, 3-90, 3-97
4-65–66, 4-71–72, 4-87

U.S. Army Corps of Engineers (Corps)
ES-24
2-16
3-90–91, 3-96, 3-108
Appendix A: A-1
Appendix I: I-16

U.S. Fish and Wildlife Service (USFWS)
ES-24, ES-26
1-1
2-16–17
3-13, 3-90–92, 3-109–110, 3-115, 3-117–119, 3-129, 3-136, 3-139–140, 3-147, 3-149
4-70–71, 4-74–75
Appendix B: B-2–4
Appendix I: I-4–6, I-11–14, I-16, I-18–20, I-2

APPENDIX A

FEDERAL AND STATE AGENCIES AND PERMITTING REQUIREMENTS

APPENDIX A: FEDERAL AND STATE AGENCIES AND PERMITTING REQUIREMENTS

Agency	Lease/Permit Action[1]
FEDERAL	
Bureau of Land Management	▪ Coal Lease ▪ Resource Recovery & Protection Plan ▪ Scoria Sales Contract ▪ Exploration Drilling Permit
Office of Surface Mining Reclamation and Enforcement	▪ Preparation of MLA Mining Plan Approval Document SMCRA Oversight
Office of the Secretary of the Interior	▪ Approval of MLA Mining Plan
Mine Safety and Health Administration	▪ Safety Permit and Legal ID ▪ Ground Control Plan ▪ Major Impoundments
Bureau of Alcohol, Tobacco, and Firearms	▪ Explosive's Manufacturer's License ▪ Explosives Use and Storage Permit
Federal Communication Commission	▪ Radio Permit: Ambulance ▪ Mobile Relay System Radio License
Nuclear Regulatory Commission	▪ Radioactive By-Products Material License ▪ Radioactive Material Certificate of Registration
Army Corps of Engineers	▪ Authorization of Impacts to Wetlands and Other Waters of the U.S.
Department of Transportation	▪ Hazardous Waste Shipment Notification
Federal Aviation Administration	▪ Radio Tower Facilities Construction Permits
STATE	
Land Commission	▪ Coal Lease ▪ Scoria Lease
Department of Environmental Quality-Land Quality Division	▪ Permit and License to Mine ▪ Permit to Construct Sedimentation Pond
Department of Environmental Quality-Air Quality Division	▪ Air Quality Permit to Operate ▪ Air Quality Permit to Construct
Department of Environmental Quality-Water Quality Division	▪ Wyoming Pollutant Discharge Elimination System Water Discharge Permits ▪ Authorization to Construct Septic Tank & Leach Field ▪ Authorization to Construct and Install a Public Water Supply and Sewage Treatment System
Department of Environmental Quality-Solid Waste Management Program	▪ Solid Waste Disposal Permit-Permanent and Construction
Engineer's Office	▪ Appropriation of Surface Water Permits ▪ Appropriation of Ground Water Permits
Industrial Siting Council	▪ Industrial Siting Certificate of Non-Jurisdiction

MLA = Mineral Leasing Act of 1920; SMCRA = Surface Mining Control and Reclamation Act of 1977

[1] All individual lease/permit actions may not be required at all mines.

APPENDIX A: FEDERAL AND STATE AGENCIES AND PERMITTING REQUIREMENTS

APPENDIX B

UNSUITABILITY CRITERIA

APPENDIX B: UNSUITABILITY CRITERIA

Unsuitability Criteria	General Recommendations for Buffalo Resources Area[1]	Findings for General Analysis Area
1. **Federal Land Systems.** With certain exceptions that do not apply to this tract, all federal lands included in the following systems are unsuitable for mining: National Parks, National Wildlife Refuges, National System of Trails, National Wilderness Preservation System, National Wild and Scenic Rivers, National Recreation Areas, Lands acquired through the Land and Water Conservation Fund, National Forests and Federal lands in incorporated cities, towns and villages.	Portions of federal lands located around Gillette, Sheridan, and Wright were determined to be unsuitable under this criterion.	None of the federal lands determined to be unsuitable under Criterion 1 are present in the general analysis area. Therefore, no unsuitable findings under Criterion 1 apply to the general analysis area.
2. **Rights-Of-Way and Easements.** Federal lands that are within ROWs or easements or within surface leases for residential, commercial, industrial, or other public purposes, on federally owned surface, are unsuitable for mining.	Portions of the BNSF and UP railroad ROWs, the Tri-County 230-kV transmission line ROW, the Wyoming 450 ROW, and the I-90 ROW were found to be unsuitable under this criterion within the general review area.	The portions of the Tri-County 230-kV transmission line ROW, the Wyoming 450 ROW, the I-90 ROW, and the BNSF and UP railroad ROWs that were determined to be unsuitable are not located within the general analysis area. Therefore, no unsuitable findings under Criterion 2 apply to the general analysis area.
3. **Buffer Zones for Rights-Of-Way, Communities, and Buildings.** Federal lands within 100 feet of a ROW of a public road or a cemetery; or within 300 feet of any public building, school, church, community or institutional building, or public park; or within 300 feet of an occupied dwelling are unsuitable for mining.	Portions of Wyoming 450, I-90, and one cemetery were found to be unsuitable under this criterion. Decisions were deferred on other highways/roads, occupied dwellings, and one school until an application to lease is filed.	Wyoming 450, I-90, and the cemetery are not located in the general analysis area. No schools are located in the general analysis area. One occupied dwelling is located west of the McGee Road in the BLM study area. Therefore, the area within the 300-foot buffer zone surrounding the occupied dwelling is designated as unsuitable for mining under Criterion 3 and the lease will be stipulated to exclude mining within this area. Portions of the Collins and McGee Roads, both Campbell County roads, are located within the general analysis area. Therefore, the portions of the general analysis area within the Collins and McGee road ROWs and their associated 100-foot buffer zones are designated unsuitable for mining under Criterion 3 and the lease will be stipulated to exclude mining within these areas unless a permit to move the roads is approved by the Campbell County Board of Commissioners.
4. **Wilderness Study Areas.** Federal lands designated as wilderness study areas are unsuitable for mining while under review for possible wilderness designation.	No lands in the general review area are within a wilderness study area.	No unsuitable findings under Criterion 4 apply to the general analysis area.
5. **Scenic Areas.** Scenic federal lands designated by visual resource management analysis as Class I (outstanding visual quality or high visual sensitivity) but not currently on National Register of Natural Landmarks are unsuitable.	No lands in the general review area meet the scenic criteria as outlined.	No unsuitable findings under Criterion 5 apply to the general analysis area.

Unsuitability Criteria	General Recommendations for Buffalo Resources Area[1]	Findings for General Analysis Area
6. **Land Used for Scientific Study.** Federal lands under permit by the surface management agency and being used for scientific studies involving food or fiber production, natural resources, or technology demonstrations and experiments are unsuitable for the duration of the study except where mining would not jeopardize the purpose of the study.	Two vegetation monitoring study sites on the Thunder Basin National Grassland (NE¼ of Sec. 1, T.41N., R.71W. and NW¼ NW¼ of Sec. 30, T.41N., R.69W.), and the Hoe Creek Site (Sec. 7, T.47N., R.72W.) were found to be unsuitable under this criterion.	The vegetation monitoring sites and the Hoe Creek site are not located in the general analysis area. Therefore, no unsuitable findings under Criterion 6 apply to the general analysis area.
7. **Cultural Resources.** All publicly or privately owned places which are included in or are eligible for inclusion in the National Register of Historic Places and an appropriate buffer zone are unsuitable.	On the basis of the consultation with the State Historic Preservation Office, there are sites within the general review area that are listed in the National Register of Historic Places. Continue using the "Standard Archeological Stipulation" on all new coal leases.	No unsuitable findings under Criterion 7 apply to the general analysis area. The "Standard Archeological Stipulation" should be applied if a lease is issued.
8. **Natural Areas.** Federal lands designated as natural areas or National Natural Landmarks are unsuitable.	No lands in the general review area are designated as natural areas or as National Natural Landmarks.	No unsuitable findings under Criterion 8 apply to the general analysis area.
9. **Critical Habitat for Threatened or Endangered Plant and Animal Species.** Federally designated critical habitat for threatened or endangered plant and animal species, and scientifically documented essential habitat for threatened or endangered species are unsuitable.	No federally designated critical habitat for threatened or endangered plant or animal species is present within the general review area.	No unsuitable findings under Criterion 9 apply to the general analysis area.
10. **State Listed Threatened or Endangered Species.** Federal lands containing habitat determined to be critical or essential for plant or animal species listed by a state pursuant to state law as threatened or endangered shall be considered unsuitable.	Wyoming does not maintain a state list of threatened or endangered species of plants or animals. Therefore, this criterion does not apply.	No unsuitable findings under Criterion 10 apply to the general analysis area.
11. **Bald or Golden Eagle Nests.** An active bald or golden eagle nest and appropriate buffer zone are unsuitable unless the lease can be conditioned so that eagles will not be disturbed during breeding season or unless golden eagle nests will be moved.	Defer suitability decisions and evaluate bald and golden eagle nests on a case by case basis at the time of leasing. Establish buffer zones around nests during mining and reclamation planning after consultation with USFWS.	No bald or golden eagle nests (active or inactive) are in the general analysis area. Evaluate suitability prior to lease issuance during consultation with the USFWS.
12. **Bald and Golden Eagle Roost and Concentration Areas.** Bald and golden eagle roost and concentration areas on federal lands used during migration and wintering are unsuitable unless mining can be conducted in such a way as to ensure that eagles shall not be adversely disturbed.	Defer suitability decisions and evaluate bald and golden eagle roost areas on a case by case basis prior to lease issuance. Establish buffer zones after consultation with USFWS.	No identified roost sites are within the general analysis area. Evaluate suitability prior to lease issuance during consultation with the USFWS.

Unsuitability Criteria	General Recommendations for Buffalo Resources Area[1]	Findings for General Analysis Area
13. **Falcon Nesting Sites and Buffer Zones.** Federal lands containing active falcon (excluding kestrel) cliff nesting sites and a suitable buffer zone shall be considered unsuitable unless mining can be conducted in such a way as to ensure the falcons will not be adversely affected.	Defer suitability decisions on falcon nesting sites and evaluate on a case by case basis prior to lease issuance. Establish buffer zones around nesting sites after consultation with USFWS.	No falcon nesting sites have been identified within the general analysis area. No unsuitable findings under Criterion 13 apply to the general analysis area.
14. **Habitat for Migratory Bird Species.** Federal lands which are high priority habitat for migratory bird species of management concern in Wyoming shall be considered unsuitable unless mining can be conducted in such a way as to ensure that migratory bird habitat will not be adversely affected during the period it is in use.	Defer suitability decisions on high priority habitat for migratory bird species of management concern in Wyoming and evaluate on a case by case basis prior to lease issuance. Establish buffer zones for nesting areas during mining and reclamation planning after consultation with USFWS.	Evaluate suitability during consultation with the USFWS.
15. **Fish and Wildlife Habitat for Resident Species.** Federal lands which the surface management agency and state jointly agree are fish, wildlife and plant habitat of resident species of high interest to the state, and which are essential for maintaining these priority wildlife species, shall be considered unsuitable unless mining can be conducted in such a way as to ensure no long-term impact on the species being provided will occur.	Defer suitability decisions on grouse leks and evaluate on a case by case basis prior to lease issuance. Establish buffer zones after consultation with Wyoming Game & Fish Department.	No sage-grouse leks are present in the general analysis area. One abandoned and two occupied sage-grouse leks are within 3 miles of the general analysis area. Evaluate this criterion prior to lease issuance. Establish buffer zones during mining and reclamation planning after consultation with the Wyoming Game & Fish Department.
16. **Floodplains.** Federal lands in riverine, coastal, and special floodplains shall be considered unsuitable where it is determined that mining could not be undertaken without substantial threat of loss of life or property.	The BLM and United States Department of Agriculture-Forest Service have determined that the identified floodplains in the general review area could potentially be mined. Therefore, all lands within the general review area are considered suitable.	Site-specific stipulations and resource protection safeguards will be applied if necessary during mining and reclamation planning. No unsuitable findings under Criterion 16 apply to the general analysis area.
17. **Municipal Watersheds.** Federal lands which have been committed by the surface management agency to use as municipal watersheds shall be considered unsuitable.	No designated municipal watersheds are present in the general review area.	No unsuitable findings under Criterion 17 apply to the general analysis area.
18. **National Resource Waters.** Federal lands with national resource waters, as identified by states in their water quality management plans, and 1/4-mile buffer zones shall be unsuitable.	No designated national resource waters are present within the general review area.	No unsuitable findings under Criterion 18 apply to the general analysis area.

Unsuitability Criteria	General Recommendations for Buffalo Resources Area[1]	Findings for General Analysis Area
19. **Alluvial Valley Floors.** Federal lands identified by the surface management agency, in consultation with the state, as AVFs where mining would interrupt, discontinue or preclude farming, are unsuitable. Additionally, when mining federal lands outside an AVF would materially damage the quality or quantity of water in surface or underground water systems that would supply AVFs, the land shall be considered unsuitable.	Consider areas determined to contain AVFs significant to farming as unsuitable. Defer decisions on other AVFs and analyze on a case-by-case basis prior to lease issuance.	No AVFs or potential AVFs have been identified in the general analysis area with characteristics indicating potential significance to farming. No unsuitable findings under Criterion 19 apply to the general analysis area.
20. **State or Indian Tribe Criteria.** Federal lands to which is applicable a criterion proposed by the state or Indian tribe located in the planning area and adopted by rulemaking by the Secretary are unsuitable.	No criterion proposed by state or Indian tribes has been approved by the Secretary of the Interior. No tribal lands are located in or near the general review area.	No unsuitability findings under Criterion 20 apply to the general analysis area.

BNSF = Burlington Northern Santa Fe Railroad; UP = Union Pacific Railroad; ROW = right of way; Wyoming 450 = Wyoming Highway 450; I-90 = Interstate Highway 90; BLM = U.S. Bureau of Land Management; USFWS = United States Fish and Wildlife Service; AVF = alluvial valley floor; kV = kilovolt

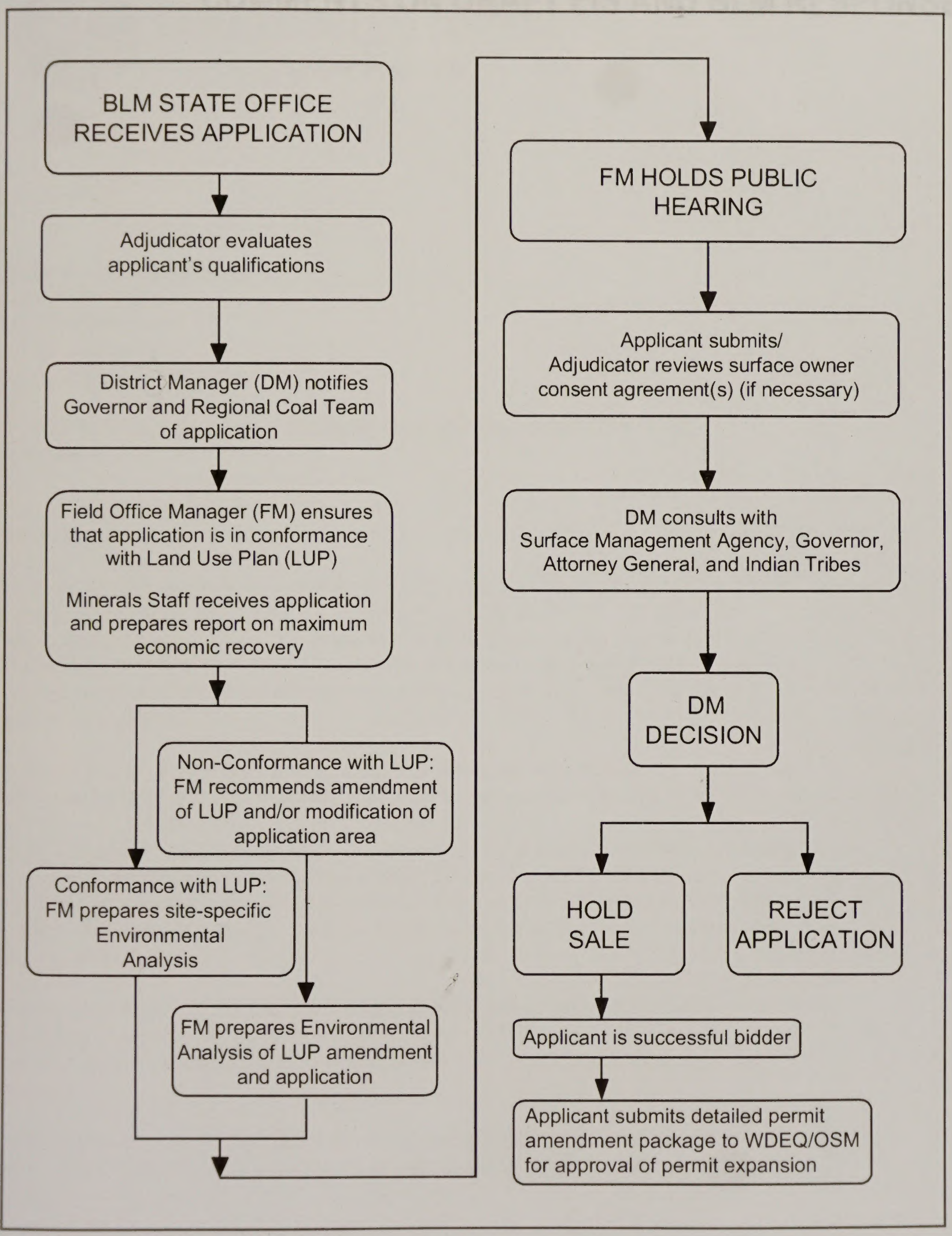
[1] BLM 1985. Buffalo Resource Area Resource Management Plan Environmental Impact Statement. Casper, Wyoming.

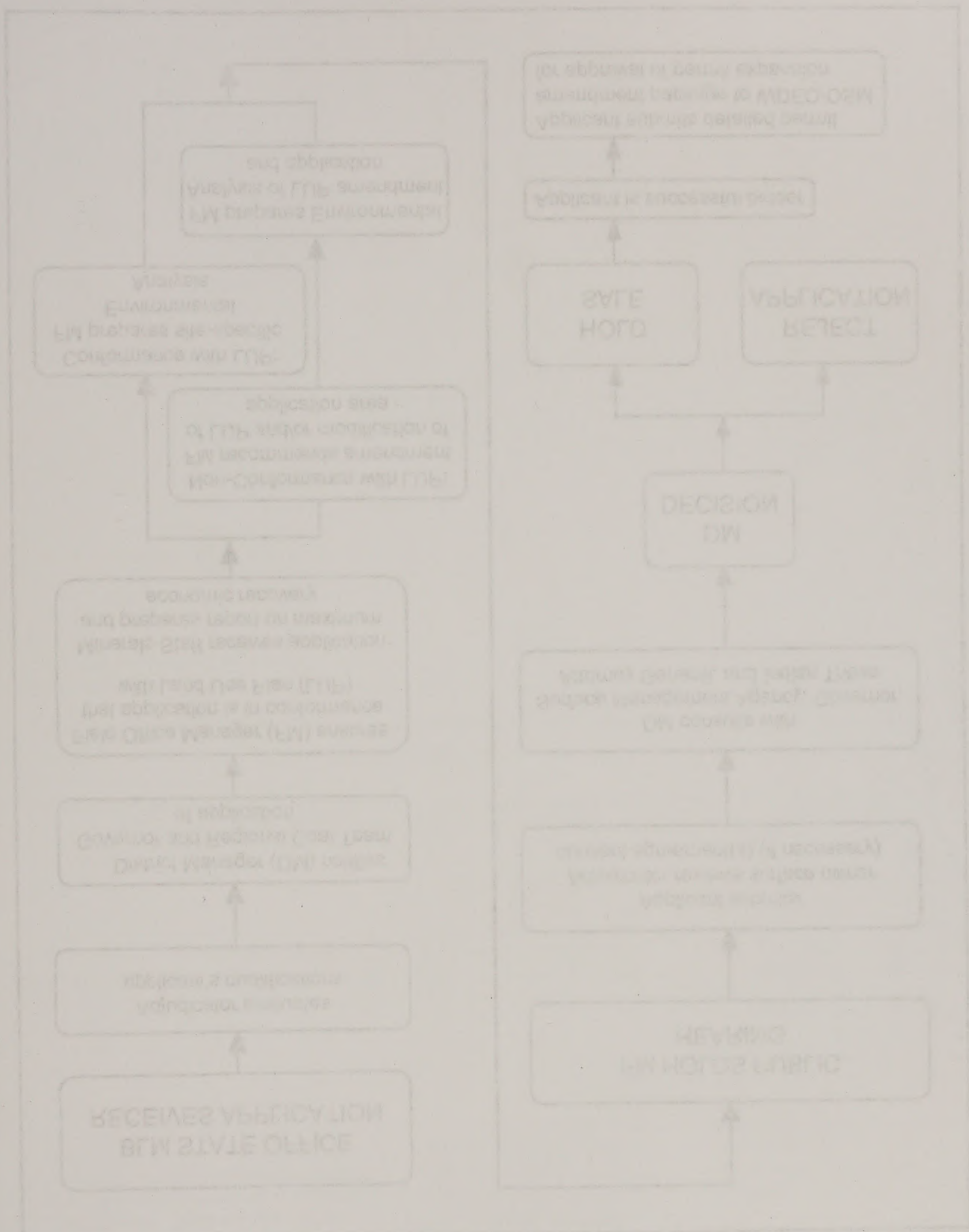
BLM 2001. Approved Resource Management Plan for Public Lands Administered by the Bureau of Land Management Buffalo Field Office. Buffalo, WY. Available: <http://www.wy.blm.gov>.

APPENDIX C

COAL LEASE-BY-APPLICATION FLOW CHART

COAL LEASE-BY-APPLICATION FLOW CHART





APPENDIX D

COMMENTS ON DRAFT EIS AND BLM RESPONSES

1

Clean Energy Action
CITIZEN POWER

May 12, 2010

Bureau of Land Management
Casper Field Office
Attn: Teresa Johnson
2987 Prospector Dr.
Casper, WY 82604

RE: Draft Environmental Impact Statement Buckskin Hay Creek II Coal Lease Application

Dear BLM,

Thank you for this opportunity to comment on the Draft Environmental Impact Statement for the Buckskin Mine Hay Creek II Coal Lease Application (WYW-172-684). As always, we appreciate the tremendous amount of work that has gone into the DEIS, but still feel that key issues have been glossed over or ignored. Adequacy of environmental impact statements is not determined by the number of pages, but by the accuracy and clarity of the analysis.

We expect you to receive several other comment letters, so we will just raise some of the issues to emphasize or complement the concerns that others will be raising.

1) This should not be a Lease by Application process. The Powder River Basin is clearly the country's largest coal producing region and coal leases should be handled in accordance with 43 Code of Federal Regulations Subpart 3420. This case is particularly egregious due to the adjustments made by the applicant in the May and November 2008 (See page ES-1). } A

2) Throughout the Draft EIS it is assumed that mining will be followed by full reclamation. This is highly unlikely to happen and the EIS should be rewritten to make it clear what additional irretrievable loss of resources will occur if the mine is not fully reclaimed. } B

3) Once-a year surveys for Ute ladies tresses are not adequate as they can persist above or below ground without flowering. (See e.g. p I-16). Additional surveys should be } C

1

conducted at several times each year during the flowering period for 5 years before moving forward with the lease. This should have been done routinely starting in 2006 when the application was first filed. } C

4) The definition of Multiple Use specifies that this means management of the various resources:

> ... without impairment of the productivity of the land, with consideration being given to the relative value of the various resources, and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output. (16 USC s. 531)

The entire EIS should be written within the context of the **actual** definition of multiple use—not with the distorted version that has become part of the federal land management agencies cultures. Multiple use is most definitely not an excuse for devastating the land—but rather an actual statutory definition that calls on the land management agency's to use long term vision and to protect the productivity of the land for future generations. } D

5) The Golden Eagle and raptor nests and roosting areas in and near the analysis area need to be protected and their existence clearly called out under the suitability criteria analysis. (See pages 3-111, 3-117 through 3-121 and B-2) } F

6) The EIS needs to be rewritten to properly acknowledge that coal is not an essential way to produce electricity. Past reliance does not lead to future reliance—anymore than past reliance on typewriters meant future reliance on typewriters. There are weak statements throughout the DEIS that imply that despite the very serious environmental impacts that will occur, the federal government is incapable of making any decision other than to lease the coal due to past large reliance on coal. With thinking like that we'd all still be living in caves, because the future could never be different than the past. } F

7) The climate change section is much improved but needs to be updated with the recent science on climate change. I will attempt to send some of these studies but there is much that has come to light since the 2007 IPCC report and this should be summarized. } G

8) The large number of Leases pending (page ES-2) adds further urgency to the need to rewrite the EIS in light of the above as well as the comments that will be submitted by others. The cumulative impacts are very significant and the EIS needs to properly reflect that and not assume that the BLM has no option but to lease the coal. } H

Thank you for the opportunity to comment.

Leslie Glustrom for Clean Energy Action
4492 Burr Place
Boulder, Colorado 80303
303-245-8637 lglustrom@gmail.com

BLM RESPONSES TO COMMENT LETTER 1

1

A) Lease by Application Process

Although the applicant modified the size of the lease application, the Bureau of Land Management (BLM) did not change the size of the study area. The applicant had modified their original application to a size, shape, and location that best allowed them to circumvent an area of sand influence that presented an increased hazard to employees. Due to delays in processing this Environmental Impact Statement (EIS), the applicant had to change the mine plan and requested that the BLM delineate a larger tract than the proposed action, but still within the BLM study area. The BLM identifies Alternative 2 in the final environmental impact statement (FEIS) as the Preferred Alternative. Under this alternative BLM delineated a tract for consideration from within the study area that is in the public interest and which considers the current mining situation.

Using the LBA process (43 CFR 3425) to maintain production at existing mines has been the practice since the Powder River Basin (PRB) Coal Production Region was decertified in 1990. Decertification recognized the area as a mature coal production region where the proper leasing mechanism was production maintenance leasing in order for the mines to replace reserves as available leased reserves were depleted. Decertification does not mean that the region is not a significant national coal producing region. Management of coal leasing in the PRB by this method has been an issue first raised in comments on the South Gillette Area Coal DEIS, and the issue was presented to the Powder River Basin Regional Coal Team (RCT) at the team's meeting in November 2009. At that meeting, a petition was made to the Secretary of Interior and BLM Director to recertify the Powder River Basin Coal Production Region. In January 2011, this petition was denied. The PRB RCT meetings are public and provide an opportunity for public comment and statements. You are welcome to present, in person or in writing, your issues to the team at any future meeting. The meetings are published in the Federal Register and a press release is posted on the BLM web site.

Processing the Hay Creek II LBA is consistent with the practice we follow in the decertified PRB coal region. This is a production maintenance tract; it has been reviewed by the Powder River Regional Coal Team, and is being reviewed under the LBA process (43 CFR 3425).

B) Reclamation

The Surface Mining Control and Reclamation Act (SMCRA) is the federal law regulating surface coal mining. BLM has no authority under SMCRA to prescribe or enforce the reclamation of coal mined lands in Wyoming. The Wyoming Department of Environmental Quality (WDEQ), Land Quality Division (LQD) permits, regulates, and monitors coal mining and reclamation. Three acts regulate coal mining and reclamation in Wyoming: 1) Wyoming's Open Cut Reclamation Act of 1969; 2) Wyoming State Environmental Quality Act of 1973; and, 3) SMCRA. The state of Wyoming has the overall authority and enforces these federal and state acts through the WDEQ/LQD. Under the federal coal leasing program, BLM has primary authority to make decisions regarding the leasing of federal coal resources, ensuring receipt of fair market value, achieving maximum economic recovery of the coal resource, and evaluating coal tracts so those offered for lease are in the public interest.

The WDEQ statutory and regulatory requirements outline strict parameters for coal mine reclamation procedures, species composition, final land surface contour, and environmental sustainability. The SMCRA requires sufficient bonding to cover anticipated reclamation costs. When mining is permitted, the WDEQ/LQD sets the bond amount for reclamation of all disturbed lands, and the operator posts an acceptable bonding instrument for this amount with the state of Wyoming. The reclamation bond is not released until a minimum of 10 years have elapsed from the date of final seeding, and the WDEQ/LQD has determined that all reclamation verifications have occurred.

The WDEQ/LQD monitors monthly all lands within the mining permit boundary, and these lands must pass requirements set by state law. Until the mines terminate their permit, the WDEQ does not require them to complete final bond release as long as contemporaneous reclamation is proceeding at the required rate and to the required standards set by state and federal laws. A percentage assessment of lands that have been released from final bonding requirements is not an accurate assessment of contemporaneous reclamation.

In the interim period between initial reclamation and final bond release, the condition and status of the lands are monitored by the WDEQ/LQD, and that information is publically available from their Cheyenne office. Reclaimed lands, regardless of the bond release status, are used by wildlife and often grazed by livestock (regulated and monitored by the WDEQ).

The mines submit reclamation plans for approval by the WDEQ during the permitting process. These plans are based on the individual mining company's mining progression. The WDEQ approves or rejects these plans based on the mining progression of the individual mine and the space needed for long-term facilities, sedimentation reservoirs, haul roads, diversions, and topsoil stockpiles. The reclamation plan is evaluated against the individual mine progression by the WDEQ to ensure reclamation is directly following the mining extraction process.

Tables 4-2 and 4-3 in the FEIS (pages 4-11 and 4-12) summarize a detailed review and projection of actual and projected disturbance and reclamation through the year 2020. This review reflects the total disturbance (including land under active mining, mined but unreclaimed land, and disturbed land that is unavailable for reclamation as a result of being occupied by long-term structures or facilities) as well as areas permanently reclaimed. The trend is that the acreage including active mining and mined but unreclaimed is expected to increase slowly, less than 1% per year, as is the acreage of land disturbed but unavailable for reclamation. The rate of permanent reclamation will be more rapid (about 4% per year). The ratio of total land reclamation to total land disturbance was around 30% in 2003, and is expected to be 45% by 2010, and approaching 60% by 2020. As of 2008, the actual ratio of total land reclamation to total land disturbance was about 45% (29,100 acres permanently reclaimed out of a total disturbance of 64,100 acres) for the Wyoming PRB mines. Of the total unreclaimed disturbance, about 23,000 acres were unavailable for reclamation (stockpiles, facilities, and sediment control) and 35,000 acres were in active mining operations (active pits and haul roads).

It is important not to equate contemporaneous reclamation with final bond release. There is a difference between lands that are in various stages of reclamation and those that have been reclaimed and released from final bonding requirements. There are several phases of bond release that the mine operators may apply for that represents every task from replacing the backfill and achieving the approved contour, to placing topsoil and permanently reseeding the

area. Final bond release on reclaimed lands indicates that the reclamation meeting permit standards has been in place in accordance with permit standards for at least 10 years and that an application for final bond release was submitted to the WDEQ.

C) Ute Ladies'-Tresses

Ute ladies'-tresses are addressed in the EIS section 3.9.3 and in appendix J. Because this species can persist below or above ground without flowering, single season surveys that meet the current US Fish and Wildlife Service (FWS) survey guidelines may not detect populations. Surveys in the general analysis area have been conducted during the last five consecutive flowering seasons (2006 through 2010). Six surveys were conducted for Ute ladies'-tresses in the general analysis area between 2004 and 2010. The surveys were completed consistent with current USFWS guidelines. No orchids were located during surveys conducted in appropriate habitats within the general analysis area in 2004 or annually from 2006 through 2010. Potential habitat for Ute ladies'-tresses is extremely limited throughout the general analysis area. No new potential Ute ladies'-tresses habitat has been added by the Proposed Action or by Alternative 2. It is BLM policy to consult on Ute ladies'- tresses with the USFWS. The consultation process was completed in August of 2010 and the USFWS stated that concurrence from the Service is not required as it was found that the leasing action would have no impact on this species.

D) Interpretation of the BLM Multiple Use Mandate

As part of the Department of Agriculture's Organic Act of 1944, the Multiple-use Sustained-Yield Act of 1960 (16 USC §531(a)) which you cite, applies to "the management of all the various renewable surface resources of the national forests (emphasis added)...."

The BLM was established within the Department of the Interior (DOI) in 1946 with consolidation of the General Land Office (created in 1812) and the US Grazing Service (formed in 1934). The General Land Office oversaw surveying, platting, mineral leasing, and the sale of public lands, while the US Grazing Service managed the public rangelands.

The Federal Land Policy and Management Act of 1976 (FLPMA), considered BLM's organic act, defines multiple use as "management of the public lands and their various resource values so that they are utilized in the combination that will best meet the present and future needs of the American people." Thus, BLM lands are managed for such purposes as grazing and natural resource development. In the 2009 secretarial order 3289 the Secretary of the Interior Ken Salazar stated, "To fulfill our nation's vision for a clean energy economy, Interior is now managing America's public lands and oceans not just for balanced oil, natural gas, and coal development, but also – for the first time ever – to promote environmentally responsible renewable energy development.".

The Mineral Leasing Act of 1920 called for leasing, exploration, and production of such minerals as coal, oil, and gas on behalf of the American public with revenue collected for the greater public good. Many of the responsibilities and functions of the General Land Office and the Grazing Service were retained in the BLM. Also within the DOI another agency was formed in 1916 - the National Park Service. This agency managed lands that were set aside to be preserved from settlement and natural resource development. The BLM and other federal agencies such as the National Park Service have many issues in common, but differ in their mandates and major functions.

The National Park Service mandate is more familiar to many people. The agency's fundamental purpose was "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." Both agencies are part of the Department of the Interior. Both agencies manage national public lands. But the lands that each agency manages were set aside by the President of the United States and by Congress to serve different functions.

E) Golden Eagles, Raptor Nests, and Raptor Roosting Areas

The protection of raptors, raptor nest sites, and roosting areas is a functional responsibility of the WDEQ. That agency addresses the subject during the mine permitting process, which takes place after coal leasing by the BLM. The USFWS must approve a Migratory Bird Species of Management Concern in Wyoming Monitoring and Mitigation Plan which covers all raptors, including eagles, before the permit to mine is approved by the WDEQ.

F) Past, Present, and Future Reliance on Coal as an Energy Source

BLM prepared this EIS in response to a lease by application received by the agency under the precepts of the Mineral Leasing Act. The BLM leases federal coal to private interests which, in the case of the PRB mine operators, supply coal primarily as fuel used to generate electricity for the American people. The demand for electricity in the US is still rising annually. Other energy sources for electric power have been and continue to be developed, but are not developing to the extent necessary to replace coal as a fuel for electrical generation during the time the Hay Creek II tract would be sold and mined, if leased. The most recent energy projections by the Energy Information Administration (EIA) to the year 2035 show that although renewable energy production increases, in order to meet projected public demand for electricity, coal use is still expected. The Hay Creek II tract, if leased, is expected to be mined and sold over a two-year period between approximately 2012 and 2018, well within the period projected by the EIA for use of coal as an energy source.

G) Climate Change

The EIS estimates the direct emission of green house gasses (GHG) from the continued operation at the four mines as a result of proposed leasing. The EIS also estimates the potential GHG volumes resulting from the assumed use of this coal at electric generation facilities throughout the US. Policies regulating specific levels of significance have not yet been established for GHG emissions as mentioned in the EIS. Given the state of the science, it is not possible to associate specific actions with the specific global impacts such as potential climate effects. Since there are no tools available to quantify incremental climate changes associated with these GHG emissions, the analysis cannot reach conclusions as to the extent or significance of the emissions on the global climate.

The potential impacts of climate change represent the cumulative aggregation of all worldwide GHG emissions. The EIS provides a meaningful context and measure of the relative significance of coal use from the proposed LBA and overall projected PRB coal production on total GHG emissions, and the EIS recognizes the effects of historic warming on the western US.

We have assumed that existing land and resource conditions within the analysis area have been and will continue to be affected by climate change under all alternatives including the No Action

Alternative. Existing climate prediction models are not at a scale sufficient to estimate potential impacts of climate change within each analysis area. We have referenced available national and regional data, most recent being the report, The Effects of Climate Change on Agriculture, Land Resources, Water Resources and Biodiversity in the United States (US Climate Change Science Program 2008). A recent (June 2009) report defined the relative degree of climate change effects that could be experienced in the future in the various regions of the US (Global Climate Change Impacts in the United States, Thomas R. Karl, Jerry M. Melillo, and Thomas C. Peterson, (eds.), Cambridge University Press). The report uses two scenarios to bracket potential climate effects and is broken into regions which divide up the US.

H) Pending Leases, Cumulative Impacts, Climate Change, BLM Options

The EIS cumulative impacts section references available national and regional data, most recent being the report, The Effects of Climate Change on Agriculture, Land Resources, Water Resources and Biodiversity in the United States (US Climate Change Science Program 2008). The recent Global Climate Change Impacts in the United States (Karl et al. 2009) defined the relative degree of climate change effects that could be experienced in the future in the various regions of the United States. The report uses two scenarios to bracket potential climate effects and is broken into regions which divide up the US. The Wyoming PRB is in the Great Plains region, which is characterized by strong seasonal climate variations. Historically the area has been subject to prolonged drought followed by wetter conditions. Average temperature increases have been predicted in the region with the greatest changes being in the winter such that commonly very cold days would become less common and warmer wetter weather more common. Under the higher heat trapping emission scenario temperatures are projected to increase over the next 100 years more so than under the lower heat trapping emission scenario. The milder winters and longer growing season is expected to favor larger numbers of insects that appear earlier and persist longer into the season. The change in climate is expected to cause a shift in wild plant and animal distributions favoring those species which are better suited for the warmer wetter climates that both the lower emission and higher emission scenarios predict for the Powder River Basin. With increasing precipitation, soil erosion in drainages and sheet flow across the land surface is expected to increase.

In chapter 4, the contribution of the site-specific alternatives to cumulative effects on the environment is evaluated. To do this, we assume that coal mining will proceed in accordance with permit conditions. We further assume that this coal will be sold to coal users in response to forecasts of demand for this coal. Historically these users have been electric utilities in the United States, although there is potential for sales outside the US. This coal market is open and competitive, and users can buy from the most cost-effective suppliers that meet their needs.

In section 4.2.14.1 and section 4.2.14.2 of the final EIS, we estimated the amount of GHG emissions that could be attributed to coal production as a result of leasing federal coal reserves under the Proposed Action and alternatives, as well as from the forecast coal production from all coal mines in the Wyoming PRB. We assumed that all PRB coal was used for coal fired electric generation as part of the total US use of coal. This gives an upper estimate of the GHG resulting from use of the coal that would be produced from the proposed LBAs and for forecast total PRB coal production. The estimate was calculated by relating the portion of coal produced in the Wyoming PRB to national steam coal totals, and then applying that ratio to the total emission of GHG estimated in the US as a result of coal fired electric generation.

The options in the EIS of the No Action Alternative, the Proposed Action, and Alternative 2, represent a wide range of options for BLM to choose from. The BLM could lease none of the coal within the study area, all of the coal in the study area, or any amount in between contained within the study area. The BLM will choose the option which is deemed best for the public interest with environmental input from the EIS.

"McKenzie, Don" <dmcken@wyo.gov>
03/18/2010 11:44 AM
To
"teresa_johnson@blm.gov" <teresa_johnson@blm.gov>
cc

bcc

Subject
Hay Creek II EIS

2

Teresa,

I have one comment on the EIS for Hay Creek II. On page 4-6, second to the last paragraph on that page, sentence number 8 within the paragraph:

"Operations at these sites are completed and the disturbed areas have been reclaimed, and monitoring of the reclaimed areas is no longer ongoing."

Wyoming is still monitoring the three permitted mine sites referenced via field inspections and groundwater monitoring at Ash Creek.

A

E-Mail to and from me, in connection with the transaction of public business, is subject to the Wyoming Public Records Act and may be disclosed to third parties.

BLM RESPONSES TO COMMENT LETTER 2

2

A) Edit

The incorrect sentence on page 4-6, second to last paragraph, sentence 8 within that paragraph, has been corrected with the information you have provided. The sentence is now in the last paragraph on page 4-6 and reads: Operations at these sites are completed and the disturbed areas have been reclaimed. Nevertheless, the WDEQ continues to monitor all three mines with field inspections; Groundwater monitoring is also conducted at the Ash Creek Mine.

Thank you for reviewing the EIS.

3

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
DENVER, CO 80202-1129
Phone 800-227-8917
http://www.epa.gov/region08

MAY 21 2010

Ref: EPR-N

Teresa Johnson
Project Manager
Bureau of Land Management
Wyoming High Plains District Office
2987 Prospector Drive
Casper, WY 82604

Re: Draft EIS for Buckskin Mine Hay Creek II Coal Lease Application [CEQ# 20100069]

Dear Ms. Johnson:

The U.S. Environmental Protection Agency (EPA) has reviewed the Bureau of Land Management's (BLM) Draft Environmental Impact Statement (EIS) for Buckskin Mine Hay Creek II Coal Lease Application to assess the consequences of holding competitive sales within the study area on 1,883 acres of federally-owned solid minerals making available 269.7 million tons of surface-mineable coal in the Powder River Basin (PRB) of Wyoming. Our review and comments are provided pursuant to Section 102(2)(C) of the National Environmental Policy Act (NEPA), 42 U.S.C. Section 4332(2)(c) and Section 309 of the Clean Air Act, 42 U.S.C. Section 7609.

The Draft EIS analyzes the no action alternative (Alternative 1), the proposed action (lease limited to just the tract proposed by the mining company for 419 acres and 77 million tons of coal reserve, and an alternative tract configuration (Alternative 2) that includes the tract for the proposed action along with additional coal reserves bounded by the BLM study area for this Draft EIS. Other alternatives were considered but not analyzed.

Air quality continues to be one of EPA's main concerns for the energy activities in the PRB. Large surface coal mines are significant particulate matter emission sources in the PRB and contribute to air quality degradation in the area. During many recent years and although the Buckskin Mine itself has not recorded high PM_{10} events, air quality monitoring in the PRB area has shown exceedances of the PM_{10} (particulate matter less than 10 micrometers in diameter, commonly referred to as fugitive dust) standards. Air quality modeling results from the PRB Coal Review for cumulative air quality impacts also predict additional increases in PM_{10} emissions for the PRB mining area, including exceedances of the PM_{10} National Ambient Air Quality Standards (NAAQS) and Prevention of Significant Deterioration (PSD) increments. Although the Wyoming Department of Environmental Quality (WDEQ) is the air permitting

authority for the area, in light of the considerable cumulative impacts, the Final EIS should consider additional mitigation measures for PM_{10}, including more stringent dust control measures than those imposed by state permits, such as Best Available Control Technology (BACT) and Best Available Control Measure (BACM), and mitigation to reduce fugitive dust from mining the lease tracts and the cumulative effects of mining in other parts of the PRB area. A 3

EPA also has concerns about the impacts of nitrogen dioxide emissions from the proposed action and needs to see a demonstration of compliance with the new one-hour NO_2 standard. Blasting that is performed to remove overburden to gain access to the coal seams can result in emissions of several products, including NO_2, because of the potential for incomplete combustion of explosives used in the mining process. Depending on the proximity of public exposure to fumes from blasting explosives, it may be appropriate to incorporate other mitigation measures into the terms of the leases. One control measure that has been successful at other PRB mines might be the use of smaller numbers of blastholes or blastholes loaded with reduced amounts of explosives to obtain more complete combustion or better control of this NO_2 generation process. B

The existing PRB Coal Review studies were used effectively in the Draft EIS discussion of the cumulative air quality impacts. We understand that an update to the PRB Coal Review air quality analysis was made in 2008 using a revised baseline year of 2004 with maximum emission levels projected for year 2015. This update is a proactive action by BLM that we support and we are always willing to provide assistance or participate in air quality working groups if needed. The results of such updated analyses might inform appropriate control measures or strategies to be developed to avoid any adverse future impacts. C

EPA's other main concern relates to the project's potential impacts on aquatic resources. The Draft EIS identifies 64 acres of wetlands in the BLM study area, 31 of which may be jurisdictional waters of the United States for purposes of the Clean Water Act (CWA). However, the U.S. Army Corps of Engineers (Corps) has not yet performed a CWA jurisdictional determination regarding the waters of the United States in the project area. This determination has been deferred until later in the CWA Section 404 permitting process and must be performed by the Corps. Pursuant to CWA Section 404 implementing regulations, the CWA Section 404(b)(1) Guidelines (40 C.F.R. Part 230), the Corps cannot issue a CWA Section 404 permit for the discharge of dredged or fill material into waters of the United States when there are other practicable alternatives to the proposed discharge that would have less adverse effects on the aquatic ecosystem. 40 C.F.R. § 230.10(a). Under the Guidelines, the Corps can issue the permit only for the least environmentally damaging practicable alternative (LEDPA). Based upon the very limited information presented in the DEIS, EPA believes that the preliminary preferred alternative, Alternative 2, likely does not represent the LEDPA for purposes of compliance with the Guidelines. According to the DEIS, less than half an acre of wetlands would be impacted by the proposed action whereas as much as 31 acres of noncontiguous acres of wetlands would be impacted by Alternative 2. EPA recommends coordination with the Corps in order to ensure the project complies with the Guidelines and the Corps can move forward with the CWA Section 404 permitting process. D

3

Consistent with Section 309 of the Clean Air Act, it is EPA's responsibility to provide an independent review and evaluation of the potential environmental impacts of this project. In accordance with our policies and procedures for reviews under NEPA and Section 309 of the Clean Air Act, EPA is rating this Draft EIS as EC-2 (EC - Environmental Concerns, 2 - Insufficient Information). This rating means that our review identified environmental impacts that should be avoided in order to fully protect the environment and the Draft EIS does not contain sufficient information or thorough analysis to fully assess the potential impacts of the project. In addition to EPA's detailed comments on the Draft EIS, a full description of EPA's EIS rating system is enclosed.

Please see the following detailed comments for our specific environmental and informational concerns. If you have any questions regarding our comments or this rating, please contact me at (303) 312-6004, or you may contact James Hanley of my staff at (303) 312-6725.

Sincerely,

Larry Svoboda
Director, NEPA Compliance and Review Program
Office of Ecosystems Protection and Remediation

Enclosure

3

General Technical Comments

Purpose and Need

1) The stated purpose of the proposed action is to provide a feasible method for the existing mine operator to avoid or bypass the Sand Channel Area to reach coal in the existing Spring Draw Lease. More information or a figure showing the sand channel area as a geological feature that affects the ability of the mining company to implement its approved mining plan would be helpful.

E

Proposed Action and Alternatives

2) EPA does not understand the difference between the no action alternative and Alternative 4 (delayed lease sale).

F

Specific Technical Comments

3) 1.1.3.4 Reclamation Activities, Page 1-12. The narrative language explaining the information in Table 1-3 has misplaced a decimal point in the percentage of land disturbance associated with long-term mining facilities (27.1% vs. 273%).

G

4) 2.2.3.1 Description of the BLM Study Area, Page 2-9. The Kiewit estimates of the BLM study area vary somewhat from the BLM estimates for the same coal reserve quantities. One explanation may be in the assignment of 56% as the recoverable factor for the in-place coal reserves when this number has been 70% historically over the life of the Buckskin Mine production. EPA recommends that this discrepancy be clarified in the Final EIS.

H

3

General Technical Air Quality Comments

The DEIS for the Buckskin Mine Hay Creek II Coal Lease Application presented results for both project-specific and cumulative air quality impact results for most criteria pollutants and Air Quality Related Values (AQRVs). Ozone analysis was not conducted but we understand from coordination meetings we hold with the BLM Wyoming State Office that the next update to the PRB Coal Review air quality analysis will include quantitative ozone analysis The project-specific analysis was conducted utilizing the ISCLT3 air dispersion model for near field impacts. The near-field results for the project-specific direct impacts for the mine were all less than the National Ambient Air Quality Standard (NAAQS) and Prevention of Significant Deterioration (PSD) standards.

Results of the cumulative analysis for the Powder River Basin (PRB) Coal Review (2008) were presented in Tables 4-11, 4-12 and 4-13 of the DEIS. The PRB Coal Review analysis was conducted utilizing the CALPUFF modeling system for sources throughout the PRB. EPA recognizes that the predicted adverse cumulative air quality impacts reflect conditions from all existing major permitted and unpermitted minor sources in the PRB region. The contribution to these predicted cumulative impacts from the proposed action is less readily apparent from the discussion in the Draft EIS.

The PRB Coal Review cumulative analysis predicted several adverse air quality impacts for the base case year of 2004 and future year of 2015 for the lower and upper reasonably foreseeable production scenarios.

1) For the 24-hour $PM_{2.5}$ in Wyoming, the base case results for 2004 predicted 88 $\mu g/m^3$ and for the future years both lower and higher 2015 production scenarios were 180 $\mu g/m^3$– well over the 24 hour NAAQS of 35 $\mu g/m^3$.

2) For the 24-hour PM_{10} in Wyoming, the base case results for 2004 predicted 250 $\mu g/m^3$and for the future years both lower and higher 2015 production scenarios were 513 $\mu g/m^3$– well over the 24 hour NAAQS of 150 $\mu g/m^3$.

3) For NO_2 in Montana, the base case results for 2004 predicted 409 $\mu g/m^3$and for the future years both lower and higher 2015 production scenarios were 826 $\mu g/m^3$– well over the new 1-Hour NO_2 NAAQS of 100 ppb (189 $\mu g/m^3$). The 1-hour NO_2 NAAQS was recently promulgated nationally and was not presented in the DEIS for Wyoming for either the direct or cumulative impact analysis.

4) For the PM_{10} PSD increment analysis, the base case result for Northern Cheyenne Indian Reservation and Wind Cave National Park indicated predictions (10 $\mu g/m^3$and 11 $\mu g/m^3$, respectively) over the PSD allowable increment of 8 $\mu g/m^3$. For the future years both the lower and higher 2015 production scenarios at the Northern Cheyenne Indian Reservation and Wind Cave National Park (14 $\mu g/m^3$and 13 $\mu g/m^3$, respectively) were over the PSD allowable increment.

3

5) Table 4-13 presents multiple adverse visibility impacts (greater than 10% visibility impairment) occurring at Class I and Sensitive Class II areas, including 26 days of impairment at Badlands National Park, 32 days of impairment at Northern Cheyenne Indian Reservation and 18 days of impairment at Wind Cave National Park for the future lower production scenario of 2015.

EPA understands that BLM has undertaken further analysis for the PRB sources that includes addressing ozone impacts. EPA is very concerned with the cumulative impact analysis results indicating degradation of air quality conditions from the PRB sources in the region. While it is not clear from the 2008 PRB Coal review specifically which sources are contributing to these impacts, the BLM should ensure that sources that are within BLM jurisdiction and management authority and are contributing to these cumulative impacts are appropriately identified and mitigated during the permitting process. We recommend that BLM convene a stakeholder working group to address our concerns through the modeling protocol and subsequent analysis. C

Section 3.4.2.3 (Page 3-56) references the Memorandum of Agreement (MOA) between the WDEQ and EPA (January 24, 1994), which acknowledges that some limitations may exist in modeling short term PM_{10} and that PM_{10} monitoring should be used for compliance purposes. The control measures described in the Draft EIS Section 3.4.2.3 provide a significant level of point source and fugitive dust control and should be updated with cooperation from the WDEQ as appropriate and if exceedance of a standard occurs. A condition of the MOA is to continue PM_{10} monitoring near the mine to ensure compliance with the 24-hour PM_{10} NAAQS. BLM should ensure that the mine operators consult with the WDEQ on any monitoring site adjustments or new monitor locations to correspond with changes in the mining activity. Particular attention should be given to shifts in the location of the active mining areas and the placement of air monitoring sites in order to determine maximum impacts from the mine. I

Specific Technical Air Quality Comments:

1) Table 3.4-1 (Page 3-43) should include the newly promulgated 1-hour NO_2 NAAQS including appropriate background concentration. J
2) Table 3.4-2 (Page 3-45) should be updated to reflect more current data through 2009. K
3) Section 3.4.2.1 (Page 3-42) EPA notes that the new 1 hour NO_2 NAAQS was not addressed in the Draft EIS. We recommend that the 1-hour NO_2 direct impact analysis be included if reasonably possible from modeling already conducted. J
4) Section 3.4.2.3 (Page 3-56) The EIS should provide an update that includes a discussion on the Exceptional Event Rule (40CFR Parts 50 and 51, 2007). L
5) Section 3.4.3.1, (Page 3-58) The EIS should include a discussion on the newly promulgated NO_2 NAAQS in relation to NO_2 emissions from the facility. M

BLM RESPONSES TO COMMENT LETTER 3

3

A) Mitigation to Reduce Fugitive Dust

This EIS discloses the mitigation measures that are already in place through enforcement by regulation or which are already being done voluntarily by the operator as part of the current adjacent mining operation on existing leases. The National Ambient Air Quality Standard (NAAQS) is not as stringent as the Wyoming Ambient Air Quality Standard (WAAQS). Therefore, the state standard must be met. The Wyoming Department of Environmental Quality (WDEQ), Air Quality Division (AQD) permits for, regulates, and approves mitigation plans for air pollution. WDEQ has stated that they will not permit mining operations that do not comply with the WAAQS. The Bureau of Land Management (BLM) does not authorize mining operations by issuing a lease and does not regulate mining operations after a lease is issued. Mining activities and the air quality mitigation plan is part of the WDEQ permitting process, which is initiated after leasing by the successful bidder. Any LBA offered because of this EIS would have a condition placed on the lease requiring the lessee to comply with the Clean Air Act (CAA) and applicable regulations (see appendix E, coal lease form, part II, section 14).

B) NO_2 Control Measure

Blasting by surface coal mines is conducted in accordance with chapter 6 of the WDEQ, Land Quality Division (LQD), Coal Rules and Regulations. Specific control measures for blasting would be developed during the permitting process, when mining operations are authorized by WDEQ/LQD.

Voluntary administrative controls are currently in place and are common components of the mines' operating procedures to mitigate and reduce blasting-related NOx emissions. The adjacent Buckskin Mine does not use cast blasts to move overburden; overburden removal is the most common source of the NO_2 clouds of greatest concern to local residents. The primary control measure for mitigating exposures to offsite residents is to avoid cast blasting when wind directions or atmospheric conditions are unfavorable. Weather and atmospheric conditions are closely monitored prior to the decision to detonate a blast. If unfavorable conditions prevail, Buckskin Mine's policy is to postpone the blast until conditions have become favorable. Blasting at the Buckskin Mine is permitted and regulated by the WDEQ.

Your suggested mitigation methods are included in section 3.4.3.3 of the EIS, which is comprehensive and has been reviewed by WDEQ/AQD.

As noted in response A above, BLM does not authorize mining operations by issuing a lease and does not regulate mining operations after a lease is issued. Section 1.3 of the EIS, discusses the fact that the WDEQ is authorized by the Secretary of the Interior to regulate surface coal mining operations on federal and non-federal lands within Wyoming.

C) Air Quality Working Groups

The Powder River Basin Coal Review (PRCR) Air Quality Protocol Group is an interagency peer group initiated with the PRCR (and continued into phase 2 of the PRCR in 2010) which provides input and review for the PRCR air resources efforts. The Environmental Protection Agency (EPA) became involved with the Powder River Basin protocol group in 2004 for the first Coal Review reports. Currently the EPA, along with BLM and others, is part of the Phase II

Stakeholder Group for the air quality portion of the Phase II Powder River Basin Air Quality Coal Review. EPA, as well as other agencies, is looking at the new modeling effort for the analysis of ozone as well as the traditional air quality issues facing the PRB region. The analysis that EPA is currently reviewing and helping to design will be used to better define the cumulative effects of ongoing development activity in the Powder River Basin to the year 2030.

D) Coordination with U.S. Army Corps of Engineers to Ensure Compliance

This discussion is located in sections 3.7.1 through 3.7.4. If an action alternative is implemented, a wetland delineation will be completed according to approved procedures. This delineation will be submitted to the Corps for verification of the amounts and types of jurisdictional wetlands and other waters present. If a lease is offered and issued, the lessee would mitigate for all impacted jurisdictional wetlands in accordance with Section 404 of the Clean Water Act. Mitigation is required at a minimum one-to-one ratio for jurisdictional wetlands. The wetland replacement plan, which must be approved by the Corps, requires no net loss of wetland area and function.

Section 404 of the Clean Water Act does not cover nonjurisdictional wetlands; however, Executive Order 11990 requires that all federal agencies protect all wetlands. Mitigation for impacts on nonjurisdictional wetlands will be specified during the permitting process as required by the authorized state or federal agency (which may include the WDEQ/LQD and the Office of Surface Mining Reclamation and Enforcement (OSM).

Text has been added to the Affected Environment (section 3.7.1) as further explanation. The last half of the paragraph now reads:

Based on the NWI maps, approximately 64.44 acres of wetlands (map 3.7-1) have been identified in the general analysis area. Of these, 30.7 acres were considered potentially jurisdictional wetlands based on field observations (table 3.7-1); the remaining 33.74 acres were either classified as potentially nonjurisdictional wetlands (e.g., borrow pits, old impoundments) or were not found to be present during the field visit (table 3.7-2). As described above, only the Corps, in conjunction with the EPA, can make an official determination of jurisdiction.

Text has also been added to section 3.7.3, Regulatory Compliance, Mitigation, and Monitoring. The first paragraph now reads:

Since the 2007 NWI-based wetland determination was completed, a portion of the general analysis area was formally delineated by ICF wetland biologists. The results of this study are currently being reviewed by the Corps and the issuance of an approved jurisdictional determination is pending. Because the jurisdictional status of the delineated wetlands and other non-wetland waters has yet to be determined, the results of the post-2007 delineation are not presented in this document.

If an action alternative is implemented, a wetland delineation will be completed for all areas outside of the area recently delineated. That report will be submitted to the Corps for verification and an approved jurisdictional determination will be requested. If unavoidable impacts on jurisdictional wetlands and other waters of the U.S. are proposed under either action alternative, a Section 404 Permit Application will be prepared. Kiewit will mitigate for all affected jurisdictional wetlands in accordance with Section 404 of the Clean Water Act.

Mitigation is required at a minimum one-to-one ratio for jurisdictional wetlands. The wetland replacement plan, which must be approved by the Corps, requires no net loss of wetland area and function.

E) Purpose and Need

The purpose of this EIS is to analyze and disclose the potential effects to the natural and human environment from the proposed leasing of a maintenance tract of federal coal in the Wyoming PRB. A mining operator applied to the BLM to lease a tract of federal coal in order to have sufficient coal reserves to continue to operate an already existing mine (see section 1.1.1 of the EIS). Although leasing this tract would not authorize mining operations, the potential impacts of mining the tract as a logical consequence of issuing the lease are evaluated (described in section 1.1.2 of the EIS). The EIS presents BLM's analysis of environmental impacts under the authority of the National Environmental Policy Act (NEPA) and associated rules and guidelines.

The original purpose and need of providing a feasible method of avoiding or bypassing a sand channel area to reach the Spring Draw lease has been modified because the time between the lease application and release of the FEIS was so great as to no longer offer a sand channel mining solution. Buckskin Mine has requested that BLM consider a tract delineation based on the configuration in the original application. The BLM study area that was analyzed under Alternative 2 fully encompasses the tract identified in the original application; therefore, the purpose and need statement has been only modified in the final EIS to delete the sand channel information.

F) Proposed Action and Alternatives

Under the No Action Alternative, BLM would determine not to offer the lease. This generally results in a rejection of the lease application and BLM closing the case; whereas, under Alternative 4, the BLM would offer a lease but delay the lease to a later date when resources or economics indicate a greater return to the American public. This alternative would result in impacts identical to those under the No Action Alternative during the period of delay. In the event that BLM later determined a sale was appropriate, including a determination that NEPA analysis is adequate, and provided that the lease application case had not been closed or withdrawn, a delayed decision to offer a tract could be issued.

G) Misplaced Decimal Point

Thank you for reviewing the draft EIS. The decimal point placement error has been corrected in the final document.

H) Nomenclature Used to Identify Coal Tonnage Estimates

BLM does not estimate the coal tons in the study area. BLM uses the coal ton numbers provided by the applicant for the estimated study area tons in the EIS. BLM will estimate the tons of coal in the preferred tract if a tract is offered for lease, and BLM will disclose this estimate of coal tons in the Record of Decision.

The coal tons estimated by the applicant are calculated based upon the physical characteristics of the study area. In-place coal, mineable coal, and recoverable coal calculations result in different number estimates because the amount of coal in each is different. Some factors that can affect the coal tons estimate are features such as geologic sand areas, roads, buildings, environmental

considerations, rights-of-way, and other things that fall into the unsuitability criteria (43 CFR 3461 and appendix B of the FEIS). The in-place coal tons number is highest because it is an estimate of how much coal is in the ground. The mineable coal number represents the amount of coal that can be mined economically using today's technology. The recoverable coal number represents the amount of coal that can be actually recovered from the mineable coal reserves and sold to market.

I) Air Quality Monitors

The EPA delegated authority to the WDEQ/AQD to implement federal programs of the CAA amendments of 1990. To ensure ongoing compliance, the WDEQ/AQD also implements an operating permit program that can require ongoing monitoring of emissions sources and/or source control systems. The Wyoming PRB mines are required by WDEQ/AQD to collect air quality data. The agency has, by statute, the authority and responsibility to require mitigation for air quality impacts.

As the delegated authority for implementing the CAA, WDEQ is best able to ensure proper placement of public or individual mine air quality monitors. Ambient air quality and air pollution emissions are regulated under federal and state law and regulations. WDEQ manages air quality through the WAAQS and regulations and the Wyoming state implementation plan.

The memorandum of agreement (MOA) of January 24, 1994 between EPA Region VIII and the State of Wyoming allows WDEQ/AQD to conduct monitoring in lieu of short-term modeling for assessing coal mining-related impacts in the PRB. This agreement remains in effect, and each coal mine is required to monitor ambient particulates according to conditions of their respective permits. The 1994 MOA also requires WDEQ/AQD to implement "Best Available Work Practice" mitigation measures at any mine where an exceedance of the PM10 air quality standard has occurred (Federal Register, September 12, 1995, Volume 60, Number 176).

WDEQ/AQD monitors air quality through an extensive network of air quality monitors throughout the state. That agency uses the monitoring data to document the air quality at all of the PRB mines, and ensures that the coal mine network monitoring schedule is consistent with 40 CFR 58.12. Data from this monitoring network is also used to identify potential air quality issues and to calculate compliance with the NAAQS. With this information, the WDEQ/AQD can stop or reverse trends that negatively affect the ambient air quality.

The eastern portion of the PRB has an extensive network of PM_{10} monitors operated by the mining industry due to the density of coal mines in the region. This network is sited to measure ambient air quality and to infer impacts from specific sources. Source-specific monitors may also be used for developing trends in PM_{10} concentrations. Continuous PM_{10} monitoring in the PRB began in 2001, and the number of continuous monitors has increased steadily since. In 2001, each mine monitored PM_{10} for a 24-hour period every six days at multiple monitoring sites through the end of the year. This frequency was increased by the WDEQ/AQD to one in every three days at many sites beginning in 2002. As a result, the eastern PRB is one of the most densely monitored areas in the country (appendix G figure G-1 in the EIS). Table G-2 in appendix G of the EIS uses the annual arithmetic average of all sites to summarize these data.

J) NO_2 1-hour standard

A discussion of the 1-hour NO_2 standard presented in table 3.4-1 has been added to the FEIS.

3

K) Table 3.4.2 PM_{10}

The table, figure, and discussion have been updated between the draft EIS (data through 2007) and the final EIS (data through 2009).

L) The Exceptional Event Rule

A discussion of the Exceptional Event Rule has been added to the FEIS in section 3.4.2.1.

M) NAAQS for NO_2

A discussion on the newly promulgated NO_2 NAAQS in relation to NO_2 emissions in the EIS general analysis area has been added to section 3.4.3.3.

4

WYOMING GAME AND FISH DEPARTMENT

5400 Bishop Blvd. Cheyenne, WY 82006

Phone: (307) 777-4600 Fax: (307) 777-4610

Web site: http://gf.state.wy.us

GOVERNOR
DAVE FREUDENTHAL

DIRECTOR
STEVE K. FERRELL

COMMISSIONERS
ED MIGNERY – President
FRED LINDZEY – Vice President
CLARK ALLAN
AARON CLARK
JERRY GALLES
MIKE HEALY
CLIFFORD KIRK

May 6, 2010

WER 320.03
Bureau of Land Management
Casper Field Office
Draft Environmental Impact Statement
Buckskin Mine Hay Creek II
Coal Lease Application
WYW-172684

Wyoming High Plains District Office
Bureau of Land Management
Attn: Teresa Johnson
2987 Prospector Drive
Casper, WY 82604-2968

Dear Ms. Johnson:

The staff of the Wyoming Game and Fish Department has reviewed the Draft Environmental Impact Statement Buckskin Mine Hay Creek II Coal Lease Application WYW-172684. We have no terrestrial wildlife or aquatic concerns pertaining to this coal lease application. A

Thank you for the opportunity to comment. If you have any questions or concerns, please contact Scott Gamo, Staff Terrestrial Biologist, at 307-777-4509.

Sincerely,

for John Emmerich
Deputy Director

JE: MF: sg

cc: USFWS
Paul Mavrakis- WGFD, Sheridan
Lynn Jahnke- WGFD, Sheridan

BLM RESPONSES TO COMMENT LETTER 4

4

Thank you very much for taking the time to review the Buckskin Mine Hay Creek II draft EIS.

5

Lesley Collins/CFO/WY/BLM/DOI

03/18/2010 04:45 PM

To

Teresa Johnson/CFO/WY/BLM/DOI@BLM

cc

bcc

Subject

Fw: public commentFW: no mountaintop explosions

Lesley A. Collins
Public Affairs
High Plains District
Office: 307-261-7603
Cell: 307-262-0716

----- Forwarded by Lesley Collins/CFO/WY/BLM/DOI on 03/18/2010 04:45 PM -----

jean public <usacitizen1@live.com>

03/18/2010 12:14 PM

To

<hay_creek_iii_wymail@blm.gov>, <woinfo@blm.gov>, <casper_wymail@blm.gov>,

<foe@foe.org>

cc

Subject

public commentFW: no mountaintop explosions

on federal register - i ioppose the ocnstructoin of this mine. we should move to solar or wind power. not these mines. } A

jean public 8 winterberry court, whitehouse station nj 08889

Date: Fri, 12 Mar 2010 03:36:33 -0800

From: jeanpublic@yahoo.com

Subject: no mountaintop explosions

To: usacitizen1@live.com

[Federal Register: March 12, 2010 (Volume 75, Number 48)]

[Notices]

[Page 11906-11907]

From the Federal Register Online via GPO Access [wais.access.gpo.gov]

[DOCID:fr12mr10-100]

DEPARTMENT OF THE INTERIOR

Bureau of Land Management

[LLWYP00000-L51100000-GA0000-LVEMK09CK380, WYW172684]

Notice of Availability and Notice of Hearing for the Buckskin Mine Hay Creek II Coal Lease by Application Draft Environmental Impact Statement, WY

AGENCY: Bureau of Land Management, Interior.

ACTION: Notice of availability.

SUMMARY: In accordance with the National Environmental Policy Act of 1969 (NEPA) and the Federal Land Policy and Management Act of 1976 (FLPMA), the Bureau of Land Management (BLM) has prepared a Draft Environmental Impact Statement (EIS) for the Buckskin Mine Hay Creek II Coal Lease by Application (LBA) and by this Notice is announcing a public hearing requesting comments on the Draft EIS, the Maximum Economic Recovery (MER), and the Fair Market Value (FMV) of the Federal coal resources.

DATES: To ensure comments will be considered, the BLM must receive written comments on the Hay Creek II Coal LBA Draft EIS, MER, and FMV within 60 days following the date that the Environmental Protection Agency publishes its Notice of Availability in the Federal Register. The public hearing will be held at 7 p.m. Mountain Standard Time, on April 22, 2010, at the Campbell County George Amos Memorial Building, 412 South Gillette Avenue, Gillette, Wyoming.

ADDRESSES: You may submit comments by any of the following methods:

E-mail: Hay_Creek_II_WYMail@blm.gov. Please include ``Hay Creek II Draft EIS--Teresa Johnson'' in the subject line.

Fax: 307-261-7587, Attn: Teresa Johnson.

Mail: Wyoming High Plains District Office, Bureau of Land

Management, Attn: Teresa Johnson, 2987 Prospector Drive, Casper, Wyoming 82604.

Written comments may also be hand-delivered to the BLM Wyoming High Plains District Office in Casper.

Copies of the Draft EIS are available at the following BLM office locations: BLM Wyoming State Office, 5353 Yellowstone Road, Cheyenne, Wyoming 82009; and BLM Wyoming High Plains District Office in Casper, 2987 Prospector Lane, Casper, Wyoming 82604. The Draft EIS is available electronically at the following Web site: http://www.blm.gov/wy/st/en/info/NEPA/cfodocs/HayCreekII.html.

FOR FURTHER INFORMATION CONTACT: Teresa Johnson or Mike Karbs, BLM Wyoming High Plains District Office, 2987 Prospector Drive, Casper, Wyoming 82604. Ms. Johnson or Mr. Karbs may also be reached at (307) 261-7600 or by e-mail at casper_wymail@blm.gov.

SUPPLEMENTARY INFORMATION: The Draft EIS analyzes the potential impacts of issuing a lease for the Hay Creek II Federal maintenance tract, serial number WYW172684.

The BLM is considering issuing a coal lease as a result of a March 24, 2006, application made by Kiewit Mining Properties, Inc. to lease the Federal coal in the Hay Creek II Tract. The Hay Creek II LBA is located in Campbell County, Wyoming, northwest of the Buckskin Mine, approximately 12 miles north of Gillette, Wyoming.

Kiewit Mining Properties, Inc. applied for the tract to extend the life of the existing Buckskin Mine in accordance with 43 CFR part 3425. On two occasions, May 19, 2008, and November 28, 2008, Kiewit Mining Properties, Inc. modified the LBA. As a result of the second modification, the Hay Creek II Tract now contains 419.04 acres. The applicant estimates that the current tract includes approximately 54.1 million tons of recoverable coal underlying the following lands in Campbell County, Wyoming:

T. 52 N., R. 72 W., 6th PM, Wyoming

Section 19: Lots 5 (W \1/2\), 6, 7, 10, 11, 12 (W \1/2\), 13(W \1/2\), 14, 15, 18, 19, 20 (W \1/2\).

Containing 419.04 acres more or less.

Consistent with Federal regulations under NEPA and the Mineral Leasing Act of 1920 (MLA), as amended, the BLM must prepare an environmental analysis prior to holding a competitive Federal coal lease sale. The Powder River Regional Coal Team recommended that the BLM process the Hay Creek II LBA after it reviewed the tract at a public meeting held on April 19, 2006, in Casper, Wyoming.

Lands in the Hay Creek II Tract contain all private surface estate which overlies the Federal coal.

The Wyoming Department of Environmental Quality (WDEQ) and the Office of Surface Mining Reclamation and Enforcement (OSM) are cooperating agencies in the preparation of the Draft EIS.

The Buckskin Mine is adjacent to the LBA and is operating under an approved mining and reclamation plan from the WDEQ Land Quality Division and an approved air quality permit from the WDEQ Air Quality Division that

[[Page 11907]]

allows Kiewit Mining Properties, Inc., to mine up to 42 million tons of coal per year.

If the tract is leased to the existing Buckskin Mine, the new lease must be incorporated into the existing mining and reclamation plan for the mine. Before the Federal coal in the tract can be mined, the Secretary of the Interior must approve the revised MLA mining plan for the Buckskin Mine. The OSM is the Federal agency that is responsible for recommending approval, approval with conditions, or disapproval of the revised MLA mining plan to the Office of the Secretary of the Interior.

The Draft EIS analyzes and discloses to the public direct, indirect, and cumulative environmental impacts associated with issuing a Federal coal lease in the decertified Powder River Federal Coal Production Region, Wyoming. A copy of the Draft EIS has been sent to affected Federal, state, and local government agencies; persons and entities identified as potentially being affected by a decision to lease the Federal coal in this tract; and persons who indicated to the BLM that they wished to receive a copy of the Draft EIS. The purpose of the public hearing is to solicit comments on the Draft EIS, on the proposed competitive sale of the Federal coal lease maintenance tract, and on the FMV and MER of the Federal coal.

The Draft EIS analyzes leasing the tract as the Proposed Action. Under the Proposed Action, a competitive sale would be held and a lease issued for Federal coal contained in the tract as applied for by Kiewit Mining Properties, Inc. As part of the coal leasing process, the BLM is evaluating adding Federal coal to the tract to avoid bypassing coal or to prompt competitive interest in unleased Federal coal in this area.

An alternate tract configuration that BLM is evaluating is described and analyzed as a separate alternative in the Draft EIS. Under the BLM Preferred Alternative, a competitive sale would be held and a lease issued for Federal coal resources contained in a tract configured by the BLM from the lands included within the study area. The tract could be larger or smaller than the Proposed Action. The Draft EIS also analyzes the alternative of rejecting the application to lease Federal coal as the No Action Alternative. The Proposed Action and alternatives being considered in the Draft EIS are in conformance with the approved Resource Management Plan for Public Lands Administered by the BLM Buffalo Field Office (2001).

Requests to be included on the mailing list for this project, for copies of the Draft EIS, or to be notified of the dates of the comment period and public hearing, may be sent in writing, by facsimile, or electronically to the addresses listed in the ADDRESSES section above. For those submitting comments on the Draft EIS, please make the comments as specific as possible with reference to page numbers and sections of the document. Comments that contain only opinions or preferences will not receive a formal response; however, they will be considered and included as part of the BLM decision-making process.

Please note that public comments and information submitted to the BLM --including the commenter's name, street address, and e-mail address--will be available for public review and

disclosure at the above address during regular business hours (7:45 a.m. to 4:30 p.m.), Monday through Friday, except holidays.

Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment, including your personal identifying information, may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

Ruth Welch,

Associate State Director.

[FR Doc. 2010-5257 Filed 3-10-10; 8:45 am]

BILLING CODE 4310-22-P

The New Busy is not the old busy. Search, chat and e-mail from your inbox.

Get started.

BLM RESPONSES TO COMMENT LETTER 5

5

A) Mountain-Top Removal

This environmental impact statement (EIS) is not evaluating a lease to a coal mine that uses mountain top removal to access coal deposits. Rather, the document presents an analysis of impacts that would result from leasing federal coal because mining is a logical consequence of issuing a maintenance lease to an existing operation

Section 1.1.3.3 of the EIS contains a full disclosure of the mining methods at the Buckskin mine. Note the dissimilarities between Powder River Basin surface coal mining and mountain top removal mining.

Chapter 3 of the EIS also describes the environmental consequences of mining the coal. The Powder River Basin (PRB) coal mines are surface coal mines which have some different issues than coal mines elsewhere in the country. Because of the topography and environment in northeast Wyoming, many of the public's concerns related to mountain top removal mining such as clear cutting, water pollution, flooding, cultural devastation, stream destruction, insufficient reclamation, and lack of good data collection and monitoring, do not directly correlate. The PRB area is semi-arid with primarily intermittent or ephemeral drainages such that surface water is not plentiful. The topography is generally rolling hills covered in open grass and sagebrush grassland plant communities. Reclamation bonding and monitoring by the Wyoming Department of Environmental Quality (WDEQ) requires that the bond be sufficient to cover the cost of full reclamation. Reclamation must be completed and self-sustaining before the bond is released. Drainages are reestablished; water quality monitored, topography returned to pre-mining contours with the exception of elevation, and cultural and socioeconomic evaluations are completed prior to bond release. According to the 2000 U.S. Census, human population density in Wyoming ranks second as the least populated state per square mile of land area with 2.3 humans per square mile. Mining and reclamation data is publically available through the WDEQ beginning in 1977 when Congress passed the Surface Mining Control and Reclamation Act. The Office of Surface Mining Reclamation and Enforcement Annual Evaluation Summary Report for the Wyoming Regulatory Program Administered by the Wyoming Department of Environmental Quality for Evaluation Year 2009 can be found at:
http://www.osmre.gov/Reports/EvalInfo/2009/WY09-reg.pdf

6

Byron and Marge Oedekoven

PO Box 605

Gillette, WY 82717

SENT VIA FAX – MAY 12, 2010

May 12, 2010

Wyoming High Plains District Office
Bureau of Land Management
Attn: Teresa Johnson
2987 Prospector Drive
Casper, Wyoming 82604

RE: Hay Creek II Draft EIS

Dear Ms. Johnson:

The draft Hay Creek II EIS points out that the location of the Collins and McGee roads in the middle of the study area creates a conflict that will need to be addressed. It is apparent to us that any relocation of the roads would involve our property. The Campbell County Commissioners have demonstrated a willingness to relocate county roads for mine development when effected land owners and the public agree. We recognize that it is in our best interest to have early input and would welcome an opportunity to discuss and negotiate the re-routing of both roads. A

Thank you for the opportunity to comment on this project.

Sincerely,

Byron Oedekoven

BLM RESPONSES TO COMMENT LETTER 6

6

A) Campbell County

Thank you for taking the time to review the Buckskin Mine Hay Creek II draft EIS. We have forwarded your letter to Campbell County Road and Bridge Director Gary Lowry.

7

Powder River Basin Resource Council
Center for Biological Diversity

May 7, 2010

Teresa Johnson
BLM, Casper Field Office
2987 Prospector Dr.
Casper, WY 82604
Submitted via electronic mail to Hay_Creek_II_WYMail@blm.gov

RE: Hay Creek II Lease Application Draft Environmental Impact Statement

Dear Ms. Johnson,

Thank you for the opportunity to submit comments on the draft environmental impact statement (DEIS) for the Hay Creek II LBA filed by Kiewit Mining Properties, Inc. (Kiewit). We submit these comments on behalf of our organizations and our members who may be impacted by the leasing of this coal and subsequent mining activities.

As acknowledged by the preparation of the Environmental Impact Statement, BLM's proposed action to lease the Hay Creek II Tract is a major action with significant environmental impacts. If BLM leases the Hay Creek II tract, it "would extend the life of the mine by approximately two years" at current production rates, DEIS at ES-4, and would "increase the recoverable reserves at the Buckskin Mine by almost 14.6%." DEIS at 4-13. The proposed action would lease 77.2 million tons of coal reserves underlying 419 acres of land in Campbell County. *Id.* at ES-5.[1]
While the Hay Creek II tract may be smaller than some of the other LBA tracts BLM is in the process of leasing, there are still significant environmental impacts that must be properly analyzed. Importantly, BLM must comply with NEPA's requirements to consider a reasonable range of alternatives and mitigation measures. Only if impacts cannot be mitigated should they be allowed. Unfortunately, in many places of the EIS, BLM fails to look at alternatives or reasonable mitigation measures that are fully within the power of the agency. This failure creates an unacceptable risk to human health and the environment.

BLM must demonstrate a true public purpose and need for this project

BLM describes the purpose of the project as helping the nation to maintain a stable supply of energy. What this leaves out, of course, is that utilities across the country are switching from coal to other fuels and renewable energy and decreasing energy demand through energy efficiency improvements. There are a number of policies driving these actions, including the threat of future carbon regulation and renewable energy standards, but in all cases, utilities would not be making these choices unless there were cost-effective for consumers.

A

[1] BLM's Alternative 2 proposes to lease a greater amount of coal: 269.7 million tons of coal reserves underlying 1,883 acres. DEIS at ES-5.

7

According to the latest available figures, comparing April of 2009 with April 2008, U.S. coal-fired generation was down 14 percent compared to the previous year, while wind generation surged ahead by 35 percent during the same period.[2] Renewable energy now generates 11 percent of our nation's electricity, and rising.[3] The trend away from fossil fuels will likely continue and accelerate.[4]

[Boardman plant which has contracts with Buckskin]

Energy efficiency is widely recognized as the most important substitute for coal. The National Academy of Sciences, in a new report, finds that U.S. projected energy demands could be reduced by at least 15 percent by 2020 and 30 percent by 2050 through energy efficiency.[5] A detailed new report by global consulting firm McKinsey and Associates finds even more savings. Non-transportation energy use in the U.S., primarily electricity, could be reduced 23 percent from projected levels by 2020 with a net savings to the economy of about $700 billion.[6] The efficiency measures employed only include those that save costs and do not even include a price on carbon. Yet another report finds that by employing efficiency measures, U.S. electricity consumption by 2050 could fall 30 percent below today's levels, despite significant growth in demand.[7] With committed employment of efficiency measures and continuing growth of renewable industries at current rates, all coal-fired plants could be shuttered within the next several decades, without any disruption to the U.S. electricity supply. In short, we continue to use coal by choice, not by necessity.

The important goals of the EPAct that BLM discusses – promoting energy efficiency, ensuring secure, affordable and reliable domestic energy, and adding energy supplies from diverse sources – can best be met through the promotion of renewable energy and efficiency measures.

A

BLM must minimize impacts to human health and the environment

The Hay Creek II LBA tract is part of a northern cluster of mines in the Powder River Basin that are close to the city of Gillette, a city of approximately 25,000, and subdivisions. The lease tract

B

---

[2] EIA, *Electric Power Monthly* (July 2009) at http://www.eia.doe.gov/cneaf/electricity/epm/epm_sum.html?featureclicked=3&.

[3] *Id.*

[4] Early in the process of building a new power plant, a developer needs to enter into a "queue" for interconnection to transmission capacity. By looking at which types of projects have entered the interconnection queue, it is possible to see what sources of electricity are likely to come on line in the next few years. According to a new Department of Energy report, there are almost 300 GW of wind power projects in the queue. Coal has less than 50 GW of generation in the queue. Planned renewables far outpace all fossil fuel and nuclear sources of likely new power combined. U.S. Department of Energy, *2008 Wind Technologies Market Report* (July 2009) at 13, available at www1.eere.energy.gov/windandhydro/pdfs/46026.pdf. And given that 100 coal-fired power plants have been cancelled since 2002, even the possible addition of 45 GW of new coal power is surely a gross overestimate of future increased generation. *Utah Coal Plant Scuttled, 100th in U.S. Since 2002*, Reuters (July 9, 2009) at http://www.reuters.com/article/GCA-GreenBusiness/idUSTRE5684UN20090709.

[5] National Academy of Sciences, *America's Energy Future: Technology and Transformation* (press release) (July 2009) available at http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=12091.

[6] Granade, H.C., et al., *Unlocking Energy Efficiency in the U.S. Economy*, McKinsey and Associates (July 2009) available at http://www.mckinsey.com/clientservice/electricpowernaturalgas/US_energy_efficiency/.

[7] Greenpeace International, *Energy Revolution: A Sustainable USA Energy Outlook* (March 2009) at 6.

is located a mere 12 miles from Gillette. DEIS at ES-1. Additionally, as the maps 3.4-4A and B show, there are several occupied residences, subdivisions, school bus stops, and other locations near the mine where air quality and noise impacts should particularly be minimized. Pursuant to CEQ regulations implementing NEPA, BLM must consider a reasonable range of alternatives and mitigation measures to minimize impacts to human health.

In particular, cumulative air emissions are of concern to our members who live in the area. As the EIS discloses, numerous coal mines, oil & gas operations, construction activities, railroads, and coal-fired power plants are located in the area, including the Dry Fork Station, which is a future source of major pollution currently under construction a mere 10 miles from the mine. Even if "the maximum modeled impacts from Buckskin and neighboring mines (including background) is about 80% of the NAAQS," public health can still be impacted from all of the various point sources and fugitive emission sources in the area. In fact, there have been violations of the 24 hour PM10 standard at the mines in the area. Without "excused" as "uncontrollable natural events" or not, these violations are of great concern to our members. Additionally, the ozone monitor located at the Thunder Basin National Grassland north of Gillette demonstrates that the area is very close to being in noncompliance for ozone standards, and if the new standard proposed by EPA is adopted, the area would actually be in noncompliance.

Additionally, site specific and cumulative air quality impacts of the mine have environmental justice implications. The DEIS makes quick work of environmental justice issues by simply claiming that there aren't any. However, the mine is close to the Northern Cheyenne Indian Reservation, a federally recognized Class 1 area. The Northern Cheyenne's air quality has already been significantly impacted by industrial development in Wyoming, and will only continue to be under BLM's current proposal. We urge BLM to engage in nation-to-nation consultation with the Northern Cheyenne and work with them to ensure their culturally-significant environment and public health are protected.

BLM should work with DEQ, EPA, and the operators themselves to ensure public health is protected. We expect a full discussion of enforceable and effective mitigation measures in the final EIS for this project.

7

B

BLM must ensure contemporaneous reclamation before leasing new coal

We appreciate the addition of new information in the reclamation activities section of the DEIS, including some mine specific reclamation and bond release status information. DEIS at 1-11 to 1-13. As we have discussed in previous comments to the BLM on coal lease proposals, BLM must consider mine-specific reclamation status, including whether the mine is currently meeting contemporaneous reclamation objectives and criteria, before deciding whether to lease new coal to the mines. Thus, this new information is a good start in that direction.

However, the new information is nowhere near sufficient and does not tell the full story of reclamation at the mine. For instance, it is unclear how BLM came to the conclusion that "the 2007 reclamation-to-disturbance ratio for the Wyoming Powder River Basin mines was approximately 80%" and "the remaining 20% of disturbance consists of long-term facilities and

C

7

infrastructure such as coal storage silos and processing plants, roads, and rail lines." DEIS at 1-11 to 1-12. First off, as BLM notes in the sentence immediately following these statistics, "the total acres listed as reclaimed for Wyoming coal mines likely includes a combination of areas that have been completely reclaimed and others that are in various stages of reclamation." *Id.* BLM does not go further and explain what is meant by "various stages of reclamation." For instance, would areas that have merely been re-graded be considered "reclaimed" under this broad definition? Additionally, if the remaining 20% consists of long-term facilities, some of the rest of the 80% of disturbed acres must undoubtedly contain areas undergoing current mining operations. Those acres have not even started to be reclaimed. Thus, the 80% number does not accurately depict how much land has actually been reclaimed to pre-mining conditions over the life of the mine. As discussed by BLM, only during Phase III bond release are the lands ensured to be re-vegetated to pre-mining conditions. As of the end of 2008, only 250 of 3,815 disturbed acres have achieved Phase III bond release. DEIS Table 1-3 at 1-13. That means 93.4% of the disturbed land has not yet obtained Phase III bond release and have thus not been properly reclaimed to pre-mining conditions.

Second, and more importantly, BLM does not connect this information to environmental impacts. Chapter 3 of the EIS, which is the chapter that covers "environmental consequences" of BLM's proposed action, does not discuss reclamation status and how the lack of contemporaneous reclamation at the mine has contributed to problems, such as reduced air quality, the spread of noxious weeds, and reduced acreage for livestock and wildlife habitat.

C

In fact, BLM's few cursory sentences in Chapter 3 that could be tied to reclamation are over-simplistic and inaccurate. BLM states that

- "Vegetation loss and subsequent reclamation would likely occur incrementally across the proposed tract, depending on the direction and rate of mining." DEIS at 3-105
- "[R]eclamation, including revegetation, will immediately follow as mining progresses through the area" and
- "The reclamation plan for the final tract configuration will include steps to control invasive, nonnative plant species." DEIS at 3-106.

BLM fails to give the issue of reclamation the "hard look" it deserves under NEPA. The final EIS for this proposed action must include detailed mine-specific information on reclamation status *and* a robust consideration of mitigation measures and alternatives, such as not leasing more coal to the company until previously mined lands are reclaimed.

BLM must appropriately analyze and mitigate impacts to groundwater quantity

BLM disclosed that "[u]nder the proposed Action, surface coal mining would permanently remove aquifers in the proposed tract (419 acres). Additionally, the Proposed Action would cause a long-term reduction in groundwater in aquifers beyond the proposed tract as a result of seepage into and dewatering from mine excavations." DEIS at 3-76.

In Chapter 4, BLM says that "[m]onitoring data verify that recharge has occurred and is continuing in the backfill." DEIS at 4-50. But BLM does take this analysis one step further and

D

7

disclose just how much recharge has occurred at the Buckskin and nearby North Gillette mines and how mining the Hay Creek II tract may impact recharge rates.

Instead of presenting the necessary analysis in this EIS, BLM states that groundwater impacts will considered as part of the WDEQ/LQD permitting process. DEIS at 4-51. In contrast to this statement, NEPA's main purpose is "to ensure that agencies make informed and considered decisions regarding an action's potential effects on the environment before it is too late to address such concerns." *Friends of the Columbia Gorge, Inc. v. Elicker*, 598 F.Supp.2d 1136, 1149-50 (D.Or. 2007), *citing Klamath-Siskiyou Wildlands Ctr. v. BLM*, 387 F.3d 989, 993 (9th Cir. 2004). This necessitates that impacts analysis be pre-decisional, in other words "before any irreversible and irretrievable commitment of resources." *Conner v. Burford*, 848 F.2d 1441, 1146 (9th Cir. 1988). In other words, BLM cannot pass its responsibilities along to the DEQ to be fulfilled at a later date.

Even if DEQ permitting related to groundwater impacts of this new coal tract has occurred prior to BLM's analysis, which it has not, BLM cannot substitute the state permitting procedure for its own NEPA analysis. BLM has an independent duty to properly analyze impacts in the NEPA process: "[a] non-NEPA document—let alone one prepared and adopted by a state government—cannot satisfy a federal agency's obligations under NEPA." *South Fork Band Council, et al. v. Dept. Interior, et al.*, No. 09-15230 (9th Cir. Dec. 3, 2009); *See also Kern v. BLM*, 284 F.3d 1062, 1073 (9th Cir. 2002) (holding that "tiering to a document that has not itself been subject to NEPA review is not permitted, for it circumvents the purpose of NEPA"). Wyoming does not have a state NEPA equivalent and thus the mere issuance of a permit cannot serve as the functional equivalent of NEPA analysis by a federal agency.

D

Therefore, BLM must consider site-specific and cumulative impacts to groundwater and options to mitigate those impacts in this EIS.

BLM must appropriately analyze and mitigate impacts to groundwater quality

BLM states that "groundwater quality in the backfill aquifer on the proposed tract is expected to be similar to that measured in existing wells completed at the backfill at the mines…[and] [g]roundwater is expected to rise to similar levels as observed prior to mining…" DEIS at 3-76.

In drawing this conclusion, BLM does not analyze *any* information related to the Buckskin mine comparing pre-mining and post-mining water quality data. BLM states that "WDEQ/LQD calculated a median TDS concentration of 3,293 mg/L for the backfill aquifer in the east-central area of the PRB." DEIS at 4-53. First off, the Buckskin mine is not a part of the south Gillette group of coal mines. Second, this information does not disclose what pre-mining water TDS concentrations were. TDS concentrations commonly increase as a result of mining.[8]

Water quality in the backfill aquifer has been an issue of concern for state and federal agencies, as well as the public. The coal aquifer is an aquifer used for drinking water and livestock purposes so water should be restored to that quality.

[8] BLM, *Spring Creek Mine Expansion Coal Lease Modification EA* at 4-9: "

Please fully disclose all pre-mining and post-mining aquifer water quality data. If impacts are occurring, BLM must analyze mitigation options. D 7

BLM must appropriately analyze and mitigate climate change impacts

Climate change is already changing weather patterns, intensifying drought, causing increased fire danger, melting Arctic sea ice, causing sea level rise and ocean acidification, and creating a host of additional dangers for people and wildlife.[9] Recent observations show greenhouse gas levels and effects on the environment that are generally at the upper bounds of, or even outstripping, recent projections.[10] Some of these impacts make clear that at today's greenhouse gas concentrations we are already beyond the natural climate variability experienced over the last several thousand years, suggesting negative climate consequences of an unpredictable magnitude yet to come.[11]

Federal scientists understand that climate change is happening and that its impacts will continue to grow. Federal agencies have issued clear and forceful reports on the magnitude of the crisis, including in two recent documents: the Global Change Research Program's June 2009 report, *Global Climate Change Impacts in the United States* ("GCRP Report") and the Environmental Protection Agency's April 2009 *Technical Support Document for Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act* ("GHG TSD"). These documents describe the impacts of climate change to human health, ecosystems, and the economy, including impacts that are already being documented in the U.S., and projections for impacts that will likely get far worse. These reports show that already, temperatures are warmer, temperature extremes have shifted upward, precipitation patterns have changed, sea levels have risen, oceans have become more acidic, and glaciers and Arctic ice have melted.[12] Indeed, much of Wyoming, the state where the proposed lease is located, has already experienced a 2 to 3°F increase in annual average temperature compared to the 1961-1979 average.[13] E

The overwhelming weight of scientific evidence leaves little doubt that unless we rapidly and completely curtail greenhouse gas emissions – primarily from burning coal, oil, and natural gas[14] – the U.S. will continue to warm at an accelerating rate and greater than the global average, and experience greater-intensity heat waves more frequently as well as changes in precipitation patterns, more frequent and severe droughts, greater-intensity hurricanes, and accelerating ocean acidification.[15]

---

[9] For the most comprehensive and up-to-date statement of the impacts of climate change in the U.S., see U.S. Global Change Research Program, *Global Climate Change Impacts in the United States* (June 2009) ("GCRP Report") available at http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts. For the most up-to-date statement of the impacts of climate change internationally, see Copenhagen Climate Congress, *Synthesis Report – Climate Change: Global Risks, Challenges and Decisions* (Mar. 2009) ("Copenhagen Report"), available at http://climatecongress.ku.dk.

[10] *Id.*

[11] *Id.*

[12] *See, e.g.*, GHG TSD at ES2-ES3.

[13] *See* GCRP Report at 28.

[14] *See id.* at 9.

[15] *See, e.g.*, GHG TSD at ES3-ES4.

7

Indeed, scientists are telling us that global greenhouse gas atmospheric concentrations are already too high, and that to avoid "severe, widespread and irreversible impacts," levels of greenhouse gases must soon be stabilized no higher than levels already reached.[16] It cannot be over-emphasized that the Earth is already past the danger point. Even stabilizing at today's atmospheric concentrations of greenhouse gases is no guarantee that severe, widespread, and irreversible climate impacts can be avoided.[17] The inescapable conclusion is that to assure a livable world we must bring greenhouse gas emissions down drastically, starting immediately. Further postponing action decreases the Earth's chances of preventing catastrophic climate change and greatly increases the eventual costs of stabilization.[18] Inaction now inevitably means more suffering and even greater economic losses in the not-too-distant future.

Coal has the worst global warming emissions profile of any conventional fossil fuel.[19] Production of one million British thermal units ("BTU") of energy from burning natural gas produces 117 pounds of CO_2, while the same energy production from sub-bituminous coal mined in the Powder River Basin produces 213 pounds of CO_2.[20] Thus, for no gain in energy output, coal from Wyoming over natural gas means 82 percent more greenhouse gases are pumped into the atmosphere.[21]

There can be no serious doubt that coal mined in the lease areas will be combusted for power generation. Therefore, the EIS is not complete without analyzing the impacts of burning that coal, including impacts on the climate. *Mid States Coal. for Progress v. Surface Transp. Bd.*, 345 F.3d 520, 549-50 (8th Cir. 2003) (when the *nature* of the effect is reasonably foreseeable but its *extent* is not, we think that the agency may not simply ignore the effect"); *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Admin.*, 538 F.3d 1172, 1217 (9th Cir. 2008) (greenhouse gas emissions are "unquestionably subject to NEPA's cumulative impacts requirements"). The first step in that analysis must be an inventory of emissions, and that inventory, once it is disclosed, will show significant amounts of CO_2 would be released as a result of this project, many more times than the DEIS admits. A substantively revised DEIS, with an opportunity for public comment, is therefore the only solution for addressing this

E

---

[16] GCRP Report at 23.
[17] *Id.*
[18] Copenhagen Report at 6.
[19] Processing oil from tar sands and from shale, which has been approved to occur in Colorado, Utah, and Wyoming by the Department of Interior and BLM, will have climate emissions portfolios worse than coal, and include significant additional impacts to air and water quality. *See* Hansen, J. 2008. Climate Threat to the Planet: Implications for Energy Policy and Intergenerational Justice. Bjerknes Lecture (slides), American Geophysical Union (stating that "…if we burn all the coal, there is a good chance that we will initiate the runaway greenhouse effect. If we also burn the tar sands and tar shale (a.k.a. oil shale), I think it is a dead certainty.").
[20] EIA, *Official Energy Statistics from the U.S. Government.*
[21] On top of that, the U.S. coal industry does not efficiently use coal as a source of energy. For example, although coal is also the dirtiest conventional fossil fuel used in Japan, it is at least used more efficiently; a kilowatt-hour of coal-fired power produced in Japan creates 418 grams of CO_2, in comparison to the 625 grams of CO_2 that are emitted to produce a kilowatt-hour of electricity in the U.S.[21] In the U.S., older coal-fired power plants can often avoid installing air pollution control equipment that is required on newer plants. For this reason, 145 of the dirtiest coal-fired power plants in the U.S. still in operation today were built in the 1940s or earlier. Pope, C., *The Clean Air Act story: back to the beginning*, Grist (Aug. 10, 2009) available at http://www.grist.org/article/2009-08-10-the-clean-air-act-story-back-to-the-beginning/.

7

otherwise unlawful omission.

7

Even when climate impacts are described in the DEIS, the best available science is not applied. For example, the DEIS asserts that, "[t]ools necessary to quantify incremental climatic changes associated with those factors for the projected development activities in the PRB are unavailable. Consequently, impact assessments of effects of specific anthropogenic activities cannot be performed." DEIS at 4-107.[22] These are the same misleading incorrect assertions that were made about other air quality models a generation ago.[23]

Likewise, the discussion on greenhouse gas emissions in Chapter 4 never actually describes the cumulative environmental consequences of this action on climate change. Instead, the section is largely devoted to a description of the role that coal plays in electricity generation now, and how important that role will remain in the future. The section is largely used to argue that because emissions from this project are small relative to global emissions, PRB emissions are of no consequence. This is the opposite of disclosure and analysis of cumulative impacts, which is required under NEPA. *Ctr. for Biological Diversity v. NHTSA*, 538 F.3d at 1217 (greenhouse gas emissions are "unquestionably subject to NEPA's cumulative impacts requirements"). Additionally, BLM's conclusion that "[i]t is not likely that selection of the No Action Alternative would result in a decrease of U.S. CO2 emissions attributable to coal-burning power plants in the longer term," DEIS at 4-117, is stunning. Where does BLM think greenhouse gas emissions come from if not mining coal and burning it?

The DEIS also excludes any and all consideration of combustion by-products like black carbon, or soot, which is generated (among other things) by combustion of fossil fuels including coal. Black carbon is a particulate that deposits to the surface of the Earth, often in Alaska, Greenland, or the Arctic Ocean, within about a week of its emission, which usually occurs in the northern hemisphere. Black carbon influences the climate both in the atmosphere and at the surface, before and after it is deposited; the contrast between black carbon, the darkest aerosol, and snow and ice, the brightest surfaces of the planet, causes black carbon to absorb sunlight and to warm the Arctic atmosphere by approximately the same amount as human-injected CO_2 in spring and summer, when snow and ice are most vulnerable to melting.[24] The DEIS must be revised and recirculated to include black carbon in its analysis of climate impacts.[25]

E

---

[22] *See also* "Because the tools necessary to quantify incremental climatic changes associated with these GHG emissions are presently unavailable, the analysis cannot reach conclusions as to the magnitude or significance of the emissions on climate change, or to associate specific actions with the specific climate impacts." DEIS at 3-206

[23] As an example, we cannot say which people exactly will actually die from an increase in ozone precursors. We cannot say exactly how many additional lives will be lost from a given increase in emissions. Nonetheless, we clearly know enough to place controls on industrial processes known to emit these dangerous ozone-forming pollutants.

[24] Zender, C.S. 2007. Arctic Climate Effects of Black Carbon. Written testimony to the Oversight and Government Reform Committee, U.S. House of Representatives. *See also* Schwartz, J. 2007. Testimony for the Hearing on Black Carbon and Climate Change House Committee on Oversight and Government Reform United States House of Representatives.

[25] *See Half Moon Bay Fishermans' Marketing Ass'n v. Carlucci*, 857 F.2d 505, 508 (9th Cir. 1988) (quoting *California v. Block*, 690 F.2d 753, 770-71 (9th Cir. 1982)) ("NEPA's public comment procedures are at the heart of the NEPA review process" and "reflect 'the paramount Congressional desire to internalize opposing viewpoints into the decision making process to ensure that an agency is cognizant of all the environmental trade-offs that are implicit in a decision.'" Thus, "[i]t is only at the stage when the draft EIS is circulated that the public and outside

7

In yet another glaring omission, the DEIS also fails to note the effect climate change is already having on the project area environment. Chapter 4 of the DEIS claims that Chapter 3 of the DEIS does so, but it is not apparent where any such discussion may be found.[26] Significant changes to temperature and precipitation regimes, well documented by scientists, are completely ignored in the section of the DEIS devoted to describing climate in the area.[27] While the BLM acknowledges that, "[i]t is assumed that existing land and resource conditions in the general analysis area have been and will continue to be affected by climate change under all alternatives," DEIS at 3-205, such a cursory description cannot satisfy BLM's responsibility to disclose and consider climate change as part of the environmental baseline for the area. NEPA requires BLM to set forth such baseline environmental conditions, as there is no way to determine what effect on the environment the leases will have without doing so, and consequently, no way to comply with NEPA. *Half Moon Bay Fisherman's Marketing Ass'n v. Carlucci,* 857 F.2d 505, 510 (9th Cir. 1998); *see also Robertson v. Methow Valley*, 490 at 349 (NEPA's fundamental purposes are to guarantee that: (1) agencies take a "hard look" at the environmental impacts of their actions by ensuring that they "will have available, and will carefully consider, detailed information concerning significant environmental impacts;" and (2) "the relevant information will be made available to the larger audience that may also play a role in both the decisionmaking process and the implementation of that decision."); *Ctr. for Biological Diversity v. U.S. Forest Serv.*, 349 F.3d 1157, 1166 (9th Cir. 2003) (NEPA "emphasizes the importance of coherent and comprehensive up-front environmental analysis to ensure informed decision-making to the end that the agency will not act on incomplete information, only to regret its decision after it is too late to correct.")

E

Some of the impacts of climate change on human health, species, and the natural environment, which BLM fails to analyze include:

- More frequent and intense heat waves
- Increases in smog
- More frequent and intense flooding and hurricanes
- More frequent and intense drought and wildfires
- Increased disease transmission
- Increased allergens
- Shrinking ranges for biological species
- Altered timing of natural events
- Rising insect epidemics
- Hotter and more acidic oceans with rising sea levels
- Impacts to polar ecosystems
- Earlier snow melt and threatened water supplies
- Unstable farming conditions

---

agencies have the opportunity to evaluate and comment on the proposal" and "[n]o such right exists upon issuance of a final EIS".); *id.* ("an agency's failure to disclose a proposed action before the issuance of a final EIS defeats NEPA's goal of encouraging public participation in the development of information during the decision making process").

[26] DEIS at 4-110.

[27] *See id.* at 3-10 to 3-11.

7

- Socio-economic costs related to all of these impacts[28]

In the recent report of the U.S. Global Change Research Program, global temperatures in the year 2100 are predicted to be 2 to 11.5°F higher than they are today.[29] Temperatures in the U.S. will rise still higher than global averages.[30] As catastrophic as such increase in one century would be, temperatures could actually change much more quickly than that.

Ice core data from Greenland reveal that the end of the last ice age was triggered by a rapid and intense warming. Air circulation patterns over the planet shifted within a year or two. The warming that followed raised planetary temperatures 22°F in just 50 years.[31] That amounts to a total warming almost double the IPCC's and the GCRP's worst-case predictions, occurring in about half the time. Runaway climate change can happen, and it did, as recently as just before the dawn of agriculture and civilization, when humans still lived as tribal hunters and gatherers.

The climate system includes numerous positive, amplifying feedback loops and no one can say for certain what their full impact on climate change will be. For example, as reflective snow and ice cover melt, darker water and land revealed below absorb more heat from the sun, thereby leading to greater melting of snow and ice. As permafrost areas melt, CO_2 and methane previously trapped in soils leak into the atmosphere leading to further warming. Higher temperatures dry out forest soils, which increases forest fires, leading to greater emissions. Acidic oceans may produce less carbon trapping plankton. Desertification may cause soils to release stored carbon and plants to reduce their sequestration.

Few climate modelers have attempted to build such feedback loops into their models. Therefore, it is possible that these amplifying effects may prove all climate model estimates to be too low. Like at the end of the last ice age, climate change could happen very quickly and to a far greater degree than generally predicted. In the present case, though, the warming would not come during an ice age, but on top of a world climate already abnormally warmed – that is, at a time when the Earth is as hot as it has been in thousands of years.

The destruction from business-as-usual climate change that is outlined above could be catastrophic. But the effect of runaway climate change would be an existential threat to human civilization itself. Clearly it is the first responsibility of political leaders in this age to do everything in their power to avoid such an outcome. Best estimates of top scientists should figure prominently when setting policy that affects climate. But when judgment is called for, it would be foolish to ignore the distinct possibility that the climate problem might get very much

E

---

[28] For a full description of all of these impacts, please see Center for Biological Diversity's comments on the Wright Area Coal Leases DEIS, submitted to BLM on Aug. 25, 2009.

[29] GCRP Report at 9.

[30] *Id.*

[31] Steffensen, J.P., K.K. Andersen, M. Bigler, H. B. Clausen, D. Dahl-Jensen, H. Fischer, K. Goto-Azuma, M. Hansson, S. J. Johnsen, J. Jouzel, V. Masson-Delmotte, T. Popp, S. O. Rasmussen, R. Rothlisberger, U. Ruth, B. Stauffer, M.-L. Siggaard-Andersen, A. E. Sveinbjörnsdóttir, A. Svensson, J. W. C. White, *High-Resolution Greenland Ice Core Data Show Abrupt Climate Change Happens in Few Years*, Science DOI: 10.1126/science.1157707 (2008).

7

worse, very quickly. Erring on the side of caution when setting climate and energy policy is clearly warranted.

Finally, BLM also fails to appropriately analyze, or consideration mitigation options related to, direct greenhouse gas emissions of mining operations. Specifically, as acknowledged by the DEIS, any methane in the coal seam that has not previously been developed by CBM operations, will be released to the atmosphere during mining. Methane is a potent greenhouse gas. Even if the amounts emitted are relatively small compared to total greenhouse gas emissions in Wyoming or the broader U.S., BLM has a duty to consider mitigation options. For instance, BLM should consider pre-mine drainage of methane. This technique is being conducted at the North Antelope Rochelle mine as part of a carbon credit system. It is a widely available technology that could easily be employed at the Buckskin Mine. This would not only reduce greenhouse gas emissions of the mine but would also prevent the waste of a much sought-after non-renewable resource.

E

BLM must also appropriately analyze impacts resulting from coal-burning, such as mercury deposition and coal combustion waste disposal

A further, previously-hidden public health and safety threat from coal came to light in December 2008, when 300 million gallons of coal ash sludge burst from a dam and spilled into the homes of fifteen families in Tennessee.[32] Kingston is not the only community with its safety threatened by coal ash dumps. There are 1300 such dumps spread across the country, filled with coal ash, arsenic, lead, mercury and selenium.[33] More than one hundred million tons of such ash are being dumped every year with no federal regulatory oversight.[34] These dumps have already polluted drinking water in dozens of states, and there is no comprehensive plan to arrest the problem.[35] Lead, cadmium, chromium, arsenic, nickel, zinc and copper are all found to be over safe levels in drinking water near ash dumps.[36]

Yet another impact on ecosystems from coal is from acid rain. Two-thirds of all U.S. sulfur oxide ("SOx") emissions and one-quarter of all NOx emissions come from burning coal.[37] The impacts of these acidic emissions on sensitive species and other wildlife is horrendous. Three quarters of lakes and one-half of streams surveyed in the U.S. have been acidified by these types of emissions.[38] Acidification is detrimental to aquatic life and frequently responsible for fish kills, especially in the Mid-Atlantic and Northeast States.[39] In many lakes, every single fish

F

---

[32] Dewan, S., *Coal Ash Spill Revives Issues of Its Hazards*, New York Times (December 24, 2008) available at http://www.nytimes.com/2008/12/25/us/25sludge.html.

[33] Dewan, S., *Hundreds of Coal Ash Dumps Lack Regulation*, New York Times (January 6, 2009) available at http://www.nytimes.com/2009/01/07/us/07sludge.html.

[34] *Id.*

[35] *Id.*

[36] *See, e.g.*, Clean Air Task Force, *Impacts to Water Quality from Placement of Coal Combustion Waste in Pennsylvania Coal Mines*, available at http://www.catf.us/publications/.

[37] EPA, *What is Acid Rain?* (June 8, 2007) available at http://www.epa.gov/acidrain/what/index.html.

[38] EPA, *Effects of Acid Rain – Surface Waters and Aquatic Animals* (Dec. 1, 2008) available at http://www.epa.gov/acidrain/effects/surface_water.html.

[39] *Id.*

7

species has been completely killed off.[40] This then leads to fish-eating birds like loons, and mammals, like otters, abandoning lakes that no longer provide food.

Acid rain also affects forest ecosystems. Slower growth, brown needles and dead trees are legacies of acid rain left along mountain ridges from Maine to Georgia.[41] In addition to killing leaves and needles directly, acid rain is absorbed into forest soils, changing soil chemistry. Unfortunately, soil nutrients can be dissolved by acid rainwater and then washed away.[42] Other, toxic chemicals can be released from minerals by acid rain, further damaging trees.[43]

Air pollution presents a multi-billion dollar per year health crisis driven to a large extent by coal-fired power and mining. These billions are in addition to the economic loss associated with the tragedy of millions of children who are slow learners or mentally retarded because of pre-natal or infant exposure to coal-fired mercury emissions. The DEIS lack adequate analysis of externalized economic costs.

There is an estimate of lost workdays associated with particulate emissions from coal-fired power plants. More than 3,000,000 days of worker productivity are lost in this country each year due to this single pollutant from coal.[44] On top of the health costs and lost productivity in the workforce, coal-fired air pollution is also responsible for lost crop and forest productivity due to ozone, particulates and acid rain.

F

BLM must analyze Kiewit's proposed coal drying facility as a connected action

Kiewit recently announced that they have entered into a partnership to build a coal drying facility near the Buckskin Mine. (See attached article). Please analyze cumulative impacts of this proposal with the mine expansion, including air quality impacts and other impacts caused by increased coal production, in the EIS for this project. According to White Energy Company North America, the company that is partnering with Kiewit on the coal drying facility, "WECNA continues to aggressively market its upgraded Buckskin coal. WECNA has been diligently responding to domestic and international RFPs in an effort to secure contracts with utilities for our coal. WECNA is expecting to respond to many more RFPs within the coming months as utilities gear up purchasing for deliveries in 2012."[45]

BLM should consider the coal drying facility as a connected action to the coal lease proposal. At the very least, emissions of the coal drying facility should be included in the cumulative impacts analysis for the project. According to information submitted to the Department of Energy, a similar proposal associated with a coal mine in Montana will produce significant emissions, including 992 thousand tons per year of carbon dioxide, 158 tons per year of sulfur dioxide, 293

G

---

[40] *Id.*
[41] EPA, *Effects of Acid Rain – Forests* (June 8, 2007) available at http://www.epa.gov/acidrain/effects/forests.html.
[42] *Id.*
[43] *Id.*
[44] *Power Plant Emissions* at 6-2.
[45] *See* http://www.whiteenergyco.com/projects/north-america/wec-north-america/index.php

7

tons per year of nitrogen oxides, 36 tons per year of particulate matter, and .21 tons per year of mercury.[46] These emissions would subject the process to PSD permitting.

While BLM briefly discusses the possibility of "coal conversion technology" in Chapter 4 of the DEIS, BLM does not discuss the White Energy Company proposal. } G

Miscellaneous Comments

1. In the discussion of the proposed DM&E railroad on page 4-14, please discuss recent status, including the withdrawal of the eminent domain suit by the company.[47] } H
2. Please add Wygen III to your list of power plants discussed on page 4-15. } I
3. Under a settlement agreement between the company and the DEQ, Two Elk Unit 1 must receive a modification to its air quality permit. Because of lack of construction status, this modification will be major and will essentially be the issuance of a new permit. We would urge BLM to take any information about Two Elk's alleged construction or financing status, discussed on page 4-15 – now or probable in the future – with a large grain of salt.
4. Additionally, there is longer an application for Two Elk Unit II pending with DEQ, as discussed on page 4-16. } J

Thank you for your time and consideration of these comments.

Sincerely,

Shannon Anderson
Powder River Basin Resource Council
934 N. Main St., Sheridan, WY 82801
sanderson@powderriverbasin.org

[46] Ambre Energy Coal Efficiency Project, Submission book for a Large-Scale Integration Project, submitted to the U.S. Dept. of Energy Loan Guarantee Program, Feb. 26, 2009.

[47] According to our members who are involved in the issue: On August 26th the DM&E Railroad dropped a condemnation suit against 14 Wyoming landowners, citing a relaxed construction schedule as the reason. They say they would need a favorable regulatory climate, available financing, a reasonable return on investment, and land rights in order to proceed. Fred Green, CEO of parent company Canadian Pacific, has stated in a letter to Pat Jacobs of Pierre , S.D. that C.P. has no plans to build the PRB project.

Amy Atwood
Center for Biological Diversity
PO Box 11374, Portland, OR 97211
atwood@biologicaldiversity.org

LIST OF REFERENCES[48]

Abt Associates, Inc., *Power Plant Emissions: Particulate Matter-Related Health Damages and the Benefits of Alternative Emissions Reduction Scenarios*, (June 2004) at 6-1, 5-6, available at http://www.catf.us/publications/

American Lung Association, *State of the Air: 2009*, available at http://www.stateoftheair.org/2009/key-findings/executive-summary.html

Army Corps of Engineers Institute for Water Resources, *Water Supply: Value to the Nation*, available at http://74.125.93.132/search?q=cache:Jk8GNY-Fp1QJ:www.spn.usace.army.mil/value_to_the_nation/WaterSupply.pdf+value+of+water+supply&cd=1&hl=en&ct=clnk&gl=us&client=firefox-a

Attfield, M., Wolfe, A., Petsonk, E., *Faces of Black Lung*, National Institute of Occupational Safety and Health, Centers for Disease Control (August 18, 2008) available at http://www.cdc.gov/niosh/blog/nsb081808_blacklung.html

Bachelet, D., R.P. Neilson, J.M. Lenihan, and R.J. Drapek, *Climate change effects on vegetation distribution and carbon budget in the United States*, Ecosystems 4:164-185 (2001)

Berg, E.E., J.D. Henry, C.L. Fastie, A.D. De Volder, and S.M. Matsuoka, *Spruce beetle outbreaks on the Kenai Peninsula, Alaska, and Kluane National Park and Reserve, Yukon Territory: Relationship to summer temperatures and regional differences in disturbance regimes*, Forest Ecology and Management 227:219-232 (2006)

Blacklund, P., A. Janetos, and D. Schimel, *The Effects of Climate Change on Agriculture, Land Resources, Water Resources, and Biodiversity. Synthesis and Assessment Product 4.3* by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research, Washington, DC (2008)

Breshears, D.D., N. S. Cobb, P.M. Rich, K.P. Price, C.D. Allen, R.G. Balice, W.H. Romme, J.H. Kastens, M.L. Floyd, J. Belnap, J.J. Anderson, O.B. Myers, and C.W. Meyer, *Regional vegetation die-off in response to global-change-type drought*, Proceedings of the National Academy of Sciences, 102:15144-15148 (2005)

Broder, J., *Climate Change Seen as Threat to U.S. Security*, New York Times (August 8, 2009) available at http://www.nytimes.com/2009/08/09/science/earth/09climate.html

Butler, C., *The disproportionate effect of climate change on the arrival dates of short- distance migrant birds*, Ibis, 45:484-495 (2003)

Center for Biological Diversity, Map of Rare Species Occurrences in the Vicinity of the Wright Area Coal Leases (Aug. 2009).

[48] Many of these references were included as hard or electronic copy attachments to Center for Biological Diversity's comments on the Wright Area LBA Tracts DEIS. If BLM needs additional copies, please let us know.

Clean Air Task Force, *Impacts to Water Quality from Placement of Coal Combustion Waste in Pennsylvania Coal Mines*, available at http://www.catf.us/publications/

Climate Prediction Center, *U.S. Seasonal Drought Outlook* (July 16, 2009) available at http://www.cpc.ncep.noaa.gov/products/expert_assessment/seasonal_drought.html

Copenhagen Climate Congress, *Synthesis Report – Climate Change: Global Risks, Challenges and Decisions* (Mar. 2009) ("Copenhagen Report"), available at http://climatecongress.ku.dk

Dewan, S., *Coal Ash Spill Revives Issues of Its Hazards*, New York Times (December 24, 2008) available at http://www.nytimes.com/2008/12/25/us/25sludge.html

Dewan, S., *Hundreds of Coal Ash Dumps Lack Regulation*, New York Times (January 6, 2009) available at http://www.nytimes.com/2009/01/07/us/07sludge.html

Duffy, P.A., J.E. Walsh, J.M. Graham, D.H. Mann, and T.S. Rupp, *Impacts of large-scale atmospheric-ocean variability on Alaskan fire season severity*, Ecological Applications 15:1317-1330 (2005)

EIA, *Official Energy Statistics from the U.S. Government*, at http://tonto.eia.doe.gov/ask/environment_faqs.asp

EIA, *Electric Power Monthly* (July 2009) at http://www.eia.doe.gov/cneaf/electricity/epm/epm_sum.html?featureclicked=3&

EIA, *Annual Energy Outlook 2009* (Mar. 2009) Executive Summary available at http://www.eia.doe.gov/oiaf/aeo/execsummary.html

EPA, *Technical Support Document for Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act* (Apr. 2009), available at http://epa.gov/climatechange/endangerment.html

EPA, *2009 U.S. Greenhouse Gas Inventory Report* (Apr. 2009) at http://www.epa.gov/climatechange/emissions/usinventoryreport.html

EPA, *National Air Quality – Status and Trends through 2007: Particle Pollution* (2008) at 24, available at http://www.epa.gov/air/airtrends/2008/

EPA, *Effects of Acid Rain – Surface Waters and Aquatic Animals* (Dec. 1, 2008) available at http://www.epa.gov/acidrain/effects/surface_water.html

EPA, *What is Acid Rain?* (June 8, 2007) available at http://www.epa.gov/acidrain/what/index.html

EPA, *Effects of Acid Rain – Forests* (June 8, 2007) available at http://www.epa.gov/acidrain/effects/forests.html

EPA, *Clean Air Mercury Rule: Basic Information* (Mar. 15, 2005) available at http://www.epa.gov/mercuryrule/basic.htm

EPA, *Particle Pollution and Your Health* (Sep. 2003) EPA-425 F-03-001 available at http://www.airnow.gov/index.cfm?action=particle.cover

Federal Response to the 2005 Caribbean Bleaching event, available at http://coralreefwatch.noaa.gov/caribbean2005/docs/2005_bleaching_federal_response.pdf (last accessed Jan. 29, 2008)

Flannigan, M.D., B.J. Stocks, and B.M. Wotton, *Climate change and forest fires*, Science of the Total Environment 262:221-229 (2000)

Forister, M.L. and A.M. Shapiro, *Climatic trends and advancing spring flight of butterflies in lowland California*, Global Change Biology 9:1130-1135 (2003)

Gibson, K.E., Mountain Pine Beetle Conditions in Whitebark Pine Stands in the Greater Yellowstone Ecosystem, R1Pub06-03, Forest Health Protection Report, USDA Forest Service, Northern Region, Missoula, MT, USA (2006)

Global Humanitarian Forum, *The Anatomy of a Silent Crisis* (May 29, 2009) at 20, available at http://www.ghfgeneva.org/OurWork/RaisingAwareness/HumanImpactReport/tabid/180/Default.aspx

Granade, H.C., et al., *Unlocking Energy Efficiency in the U.S. Economy*, McKinsey and Associates (July 2009) available at http://www.mckinsey.com/clientservice/electricpowernaturalgas/US_energy_efficiency/

Government Accountability Office, *Federal Compensation Programs: Perspectives on Four Programs*, GAO-06-230 (November 2005) available at http://www.gao.gov/products/GAO-06-230

Hansen, J. 2008. Climate Threat to the Planet: Implications for Energy Policy and Intergenerational Justice. Bjerknes Lecture (slides), American Geophysical Union

Hansen, J., et al., Target Atmospheric CO_2: Where Should Humanity Aim?, The Open Atmospheric Science Journal 217, 229 (2008)

Hansen, J., M. Sato, R. Ruedy, K. Lo, D. W. Lea, M. Medina-Elizade. 2006. *Global temperature change*, Proceedings of the National Academy of Sciences (PNAS) Published online September 25, 2006, doi:10.1073/pnas.0606291103

Harvell, C.D., C.E. Mitchell, J.R. Ward, S. Alitzer, A.P. Dobson, R.S. Ostfeld, and M.D. Samuel, *Climate Warming and Disease Risks for Terrestrial and Marine Biota*, Science 296(5576):2158-2162 (2002)

Hoegh-Guldberg, O. 2005. Marine Ecosystems and Climate Change. Climate Change & Biodiversity, [Lovejoy, T.E., L. Hannah (eds.)]

Hu, A., Meehl, G.A., Han, W., Yin, J., *Transient Response of the MOC and Climate to the Potential Melting of the Greenland Ice Sheet in the 21st Century*, Geophysical Research Letters, 36:L10707 (May 29, 2009)

Insurance Journal, *2008 Losses Lead to Record Insurance Payments for Midwest Farmers* (July 22, 2009) available at http://www.insurancejournal.com/news/midwest/2009/07/22/102419.htm

Intergovernmental Panel on Climate Change (IPCC) Climate Change 2007: Impacts, Adaptation and Vulnerability, *Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Parry, M.L., O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA (2007)

Inouye, D.W., B. Barr, K.B. Armitage, and B.D. Inouye, *Climate change is affecting altitudinal migrants and hibernating species*, Proceedings of the National Academy of Sciences 97:1630-1633 (2000)

Inouye, D.W. 2008, *Effects of climate change on phenology, frost damage, and floral abundance of montane wildflowers*, Ecology 89(2):353-362 (2008)

Jaffe, M., *From Calif. To Denver: Ozone woes become regional*, Denver Post (November 2, 2008) available at http://www.denverpost.com/newsheadlines/ci_10878107.

Jaffe, M., *The cold truth about ozone*, Denver Post (March 4, 2009) available at http://www.denverpost.com/breakingnews/ci_11829606.

Jerrett, M., Burnett, R. T., Pope, C. A., Ito, K., Thurston, G., Krewski, D., Shi, Y., Calle, E., Thun, M., *Long-Term Ozone Exposure and Mortality*. New England Journal of Medicine (March 12, 2009) 360: 1085-1095

Logan, J.A., J. Régnière, and J.A. Powell, *Assessing the impacts of global warming on forest pest dynamics*, Frontiers in Ecology and Environment 1(3):130-137 (2003)

Mahaffey, K., *Update on Recent Epidemiologic Mercury Studies*, in Proceedings in the 2004 National Forum on Contaminants in Fish (January 2004) available at http://nepis.epa.gov/Exe/ZyNET.exe/901T0200.txt?ZyActionD=ZyDocument&Client=EPA&Index=2000%20Thru%202005|Hardcopy%20Publications&Docs=&Query=asbestos%20risk%20&Time=&EndTime=&SearchMethod=2&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&UseQField=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A\ZYFILES\INDEX%20DATA\00THRU05\TXT\00000011\901T0200.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h|-&MaximumDocuments=10&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=p|f&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page

National Academy of Sciences, *America's Energy Future: Technology and Transformation* (press release) (July 2009)

National Climatic Data Center, *Climate of 2009 – June in Historical Perspective* (July 16, 2009) available at http://www.ncdc.noaa.gov/oa/climate/research/2009/jun/global.html

Nevada Division of Forestry, *The True Costs of Wildfires Revealed* (May 12, 2009)

Parmesan, C. and G. Yohe, *A globally coherent fingerprint of climate change impacts across natural system*, Nature 421:37 (2003)

Powder River Coal Company, *Environmental Issues*, available at http://www.ccsd.k12.wy.us/mines/PR/Environment.html

Rosenzweig, C., et al., *Attributing physical and biological impacts to anthropogenic climate change*, Nature 453:353-357 (May 15, 2009)

Running, S.W., *Is global warming causing more larger wildfires?*, Science 313:927-928 (2006).

Ryan, M.G., S.R. Archer, R.A. Birdsey, C.N. Dahm, L.S. Heath, J.A. Hicke, D.Y. Hollinger, T.E. Huxman, G.S. Okin, R. Oren, J.T. Randerson, and W.H. Schlesinger, (2008) Land resources. In: *The Effects of Climate Change on Agriculture, Land Resources, Water Resources, and Biodiversity. Synthesis and Assessment Product 4.3 by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research, Washington, DC*

Soloman, A.M., and A.P. Kirilenko, *Climate Change and Terrestrial Biomass: What if Trees do not migrate?*, Global Ecology and Biogeography Letters 6(2):139-148 (1997)

Soni, A., *Allergic Rhinitis: Trends in Use and Expenditures, 2000 and 2005*, Agency for Healthcare Research and Quality (May 2008)

Spracklen, D. V., L. J. Mickley, J. A. Logan, R. C. Hudman, R. Yevich, M. D. Flannigan, and A. L. Westerling, *Impacts of climate change from 2000 to 2050 on wildfire activity and carbonaceous aerosol concentrations in the western United States. J. Geophys. Res.* (June 18, 2009)

Steffensen, J.P., K.K. Andersen, M. Bigler, H. B. Clausen, D. Dahl-Jensen, H. Fischer, K. Goto-Azuma, M. Hansson, S. J. Johnsen, J. Jouzel, V. Masson-Delmotte, T. Popp, S. O. Rasmussen, R. Rothlisberger, U. Ruth, B. Stauffer, M.-L. Siggaard-Andersen, A. E. Sveinbjörnsdóttir, A. Svensson, J. W. C. White, *High-Resolution Greenland Ice Core Data Show Abrupt Climate Change Happens in Few Years*, Science DOI: 10.1126/science.1157707 (2008)

Stern, N., *The Stern Review: The Economics of Climate Change*, HM Treasury, London (2006), available at http://www.hm-treasury.gov.uk/sternreview_index.htm

Thompson, J.R., T.A. Spies, and L.M. Ganio, *Reburn severity in managed and unmanaged vegetation in a large wildfire*, Proceedings of the National Academy of the Sciences 104(25):10743-10748 (2007)

Tol, Richard S.J., *The Social Cost of Carbon: Trends, Outliers and Catastrophes*, Economics: The Open-Access, Open-Assessment E-Journal, Vol. 2, 2008-25 available at http://www.economics-ejournal.org/economics/journalarticles/2008-25

U.S. Department of Energy, *2008 Wind Technologies Market Report* (July 2009) at 13, available at www1.eere.energy.gov/windandhydro/pdfs/46026.pdf

U.S. Department of Labor, *Employment Law Guide: Black Lung Compensation* available at http://www.dol.gov/compliance/guide/blklung.htm

U.S. Geological Service, *Mercury in Fish, Bed Sediment, and Water from Streams across the United States 1998-2005* (Aug. 2009) Scientific Investigative Report 2009-5109 available at http://pubs.usgs.gov/sir/2009/5109/

U.S. Global Change Research Program, *Global Climate Change Impacts in the United States* (June 2009) ("GCRP Report") available at http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts

Van Mantgem, P.J., and N.L. Stephenson, *Apparent climatically induced increase of tree mortality rates in a temperate forest*, Ecology Letters 10:909-916 (2007)

Volney, W.J.A. and R.A. Fleming, *Climate change and impacts of boreal forest insects*, Agriculture, Ecosystems & Environment 82:283-294 (2000)

Westerling, A.L., H.G. Hidalgo, D.R. Cayan, and T.W. Swetnam, *Warming and earlier spring increase western U.S. forest wildfire activity*, Science 313:940-943 (2006)

Western Forestry Leadership Coalition, *The True Cost of Wildfire in the Western U.S.* (Apr. 13, 2009), available at http://www.wflcweb.org/infomaterials/reports.php

Worldwatch Institute, *Wind Power Increase in 2008 Exceeds 10-Year Average Growth Rate* (May 7, 2009) at http://www.worldwatch.org/node/6103

Zender, C.S. 2007. Arctic Climate Effects of Black Carbon. Written testimony to the Oversight and Government Reform Committee, U.S. House of Representatives. *See also* Schwartz, J. 2007. Testimony for the Hearing on Black Carbon and Climate Change House Committee on Oversight and Government Reform United States House of Representatives.

7

http://www.trib.com/articles/2009/01/06/news/wyoming/e2479fb63d1a96da8725753600022559.txt

TUESDAY JANUARY 6, 2009 :: Last modified: Monday, January 5, 2009 7:03 PM MST

Firm plans coal upgrade plant

By DUSTIN BLEIZEFFER
Star-Tribune energy reporter

After several decades and many attempts, enterprises aiming to upgrade Powder River Basin coal have had only fleeting success. Now, there's another project in the works, and the developers say their plan will achieve commercial viability.

"What makes our product different is ours is stable and not prone to spontaneous combustion; second, it's not dusty; and third, our economics are competitive," said Judy Tanselle, president of White Energy Coal North America.

White Energy and Buckskin Mining Co. announced Monday an agreement to develop an $80 million coal upgrading facility to be constructed at the Buckskin coal mine just north of Gillette.

The plan is to have the facility in operation sometime in the second quarter of 2010 with an annual output of 1.1 million tons of "binderless coal briquettes," according to the companies. The process involves heat and pressure to remove moisture from the coal, producing briquettes with a heating value 35 percent higher than raw Powder River Basin coal.

Tanselle said the company will target utilities that are not currently using Powder River Basin coal, noting that those customers of Eastern bituminous coals are looking for a cleaner product with a higher heating value.

"We see it as an expansion of the Powder River Basin coal market. Those already burning Powder River Basin coal have very little incentive to replace it," Tanselle said.

Evergreen Energy constructed a coal upgrading plant at the Fort Union mine north of Gillette in 2006. The "K-Fuel" process used two Sasol-Lurgi gasification vessels to heat and pressurize the coal, which reduced the coal's high moisture content. It also stripped some mercury, sulfur and nitrogen oxides, resulting in a lighter, drier coal with a higher heating value.

But the plant was quickly shuttered in 2007, and Evergreen is working to develop the technology in Asia and other parts of the globe.

White Energy Coal North America Inc. is headquartered in Maryland, and is a U.S. subsidiary of White Energy Company Limited, a Sydney-based company. The parent company is the exclusive worldwide license holder of the "Binderless Coal Briquetting" process.

Contact energy reporter Dustin Bleizeffer at (307) 577-6069 or dustin.bleizeffer@trib.com

BLM RESPONSES TO COMMENT LETTER 7

7

A) Purpose and Need—U.S. Energy Portfolio—Range of Alternatives

Section 1.2 of the final environmental impact statement (FEIS) clearly states the purpose and need of the document as well as the proposed action. The purpose of this EIS is to analyze and disclose the potential effects to the natural and human environment from the proposed leasing of a maintenance tract of federal coal in the Wyoming Powder River Basin (PRB). A mining operator applied to lease a tract of federal coal in order to have sufficient coal reserves to continue to operate an already existing mine (FEIS at 1.1.1). Although leasing this tract would not authorize mining operations on those lands, the EIS evaluates the potential impacts of mining because it is a logical consequence of issuing a lease for a maintenance tract of federal coal (FEIS at 1.1.2). The EIS presents BLM's analysis of environmental impacts under the authority of the National Environmental Policy Act (NEPA) and associated rules and guidelines.

The FEIS explains the extent of BLM's decision-making authority to lease coal on federal lands and our mission under the various mineral leasing laws, which is to encourage the development of domestic coal reserves and to reduce US dependence on foreign sources of energy.

The EIS is not intended to be an environmental analysis of the numerous technologies that are capable of producing electricity. We have revised the FEIS to include additional information regarding the projected electric generation portfolio of the United States. Studies have indicated that even with a considerably more optimistic projection for renewable sources, coal use continues to be projected as the largest portion of the domestic electric fuel mix until at least 2035.

The population in the US has increased by about 20 percent and energy consumption by a comparable 18 percent since 1990, with variations in energy use per capita depending on weather, the economy, etc. As population and activities have increased, carbon-based fuels (coal) have been used to provide for these additional energy needs.

As stated in chapter 4, ongoing scientific research is working to identify the potential impacts of greenhouse gases (GHG) on global climate. Our analysis recognizes that the addition of non-carbon fueled electric generation sources could reduce future GHG emissions. Further, the addition of alternate sources of electric generation would potentially help to conserve carbon-based fuels and provide a broader portfolio of electric sources. However, the environmental effects and impacts associated with the wide variety of renewable electric generation technologies are well beyond the scope of this EIS. Individual projects associated with alternative electric generation technologies would be evaluated and analyzed on their own merit separately under the NEPA process. In order for an alternative energy project to come to fruition, there must first be a valid proponent to propose, support, and fund the project.

BLM has wide discretion in determining the extent and identification of lands to consider offering in response to a coal lease application. The FEIS addresses a full range of alternatives to the lease by application (LBA) submitted by the applicant. The range includes an alternative which would represent all lands that include coal reserves that are comparable to those applied for, which may be efficiently recovered with the LBA, which may enhance competitive interest in the tract, and which could be bypassed if not leased. On the other end of the range is the No

Action Alternative. Under the No Action Alternative, ongoing mining activities would continue and no new coal reserves would be leased to Kiewit.

B) Human Health and the Environment

In the FEIS, noise impacts are covered in section 3.14.2, Human health is covered in section 3.18.2, and environmental justice is covered in section 3.17.7.2.

BLM does not have expertise regarding conducting human health assessments. During preparation of the EIS, BLM contacted the Wyoming Department of Health/ Environmental Health Section and invited them to review and provide comment on the EIS. BLM has also contacted the Center for Disease Control and Prevention. Both agencies declined to participate.

The FEIS identifies both site-specific (i.e., specific to the Buckskin Mine) and cumulative impacts to air quality. This is done by including monitoring data for a variety of regulated air pollutants, as well as predictive models that estimate pollutant concentrations and other air quality parameters based on emission and climate models. The analysis discloses actual and modeled air quality impacts and is available to anyone wishing to see it.

Air pollution is controlled by state and federal air quality regulations and standards established under the federal Clean Air Act (CAA) amendments of 1990, administered by the Environmental Protection Agency (EPA). The EPA established the National Ambient Air Quality Standards (NAAQS) under the authority of the CAA. The Wyoming Ambient Air Quality Standard (WAAQS) for the PM10 annual, the SOx annual, and 24-hour levels are more stringent than the NAAQS and are enforced by the Wyoming Department of Environmental Quality (WDEQ), Air Quality Division (AQD). State implementation plans are in place to ensure that proposed actions like coal mining comply with all associated air quality regulations and criteria. WDEQ/AQD issues permits to mine coal under the authority delegated to them by the EPA under the CAA. In Wyoming, mines in the PRB are permitted under the CAA as regulated emission sources. Permits issued by the WDEQ identify mitigation measures that the permittee must implement in order to comply with the permit. These measures, currently in place at the Buckskin Mine as well as other PRB mines, are described in section 3.4.2.3 of the EIS. The WDEQ/AQD is authorized to condition permits as necessary for mitigation, and they will not permit an activity that does not comply with the WAAQS.

Large surface coal mines in the PRB have the potential to become particulate emission sources contributing to air quality degradation. As stated in section 3.4.2.1 and section 3.4.2.3 of the EIS, the WDEQ/AQD requires the Wyoming PRB mines to collect air quality data. The eastern Powder River Basin is one of the most intensely monitored areas in the world for air quality. As explained throughout the EIS, WDEQ/AQD has, by statute, the authority and responsibility to require mitigation for air quality impacts.

Ozone is included in the EIS discussion regarding NO_x emissions since NO_x is one of the main components involved in the formation of ground level ozone. As previously discussed, EPA is the agency chiefly responsible for national air quality regulations and authorities concerning ozone, CO_2, and the development of national standards.

Ozone monitoring is not required by WDEQ at the PRB coal mines; however, the agency has been monitoring ozone at sites in the PRB since 2001. An exceedance of the O_3 8-hour standard

occurs if the fourth-highest daily maximum value is above the level of the standard. On January 6, 2010, EPA proposed to strengthen the NAAQS for ground-level ozone. The agency is also proposing to strengthen the 8-hour "primary" ozone standard to a level within the range of 0.060-0.070 ppm. Comments received on the proposed monitoring requirements are being accepted, and the WDEQ plans to issue a final rule in coordination with the final ozone standards by the end of July 2011.

Table 3.4-4 shows the O_3 standard has not been exceeded at the Thunder Basin National Grassland north ozone monitor (the monitoring site closest to the Buckskin Mine, about 20 miles northeast of the mine) when evaluated under the standard in place at the time the values were recorded. For the PRB region, exceedances of the current standard (75 ppm) have been recorded at Thunder Basin and some high values (greater than 65 ppm) have been recorded at the South Campbell County and Devils Tower stations in recent years. Although the northern PRB is still considered an ozone attainment area, there is potential for this area to be designated "non-attainment" if a new lower standard is established.

Determining if an area could be deemed "non-attainment" for ozone after the new standard is issued requires air monitoring results in the area to show that the three-year average of the fourth highest daily maximum 8-hour average exceeds the standard. This determination requires three years of monitoring data, documented exceedances of the standard, and the state designating a geographic area around the monitored area. EPA has to approve this geographic area, and the state would then prepare a SIP (state implementation plan) outlining how the area is to be brought back into compliance. The resulting SIP would outline regulatory measures that would pertain to all air quality permits in that area. If a new standard is issued, it would immediately become effective. Wyoming may adopt the new standard into its rules, but until it does, there would be two standards in effect (state and federal). Compliance would be determined in accordance with the more stringent standard.

The comment submits the statement that ozone levels in the PRB are very close to non-compliance. BLM cannot make that assertion based on the limited data that are currently available, both temporally and spatially, for the PRB. For example, the highest recorded value occurred in 2003, seven years in the past. Additional data from these two sites and preferably a larger ozone air quality monitoring network that covers more of the basin is needed before any trends can be clearly defined.

Section 3.17.7 in the EIS addresses environmental justice and the impacts related to the proposed leasing of the Hay Creek II tract. The cumulative visibility impacts resulting from projected development within the Powder River Basin would be no more acute for Native American populations than for the general public. The Northern Cheyenne have been included in the scoping and public review of this EIS.

C) Contemporaneous Reclamation

Section 1.1.3.4 discusses reclamation activities, and table 1-3 provides a summary of land status acreage at the Buckskin Mine. Contemporaneous reclamation required by the state of Wyoming is also occurring at the mine. The Buckskin Mine meets or exceeds the reclamation requirements set forth. BLM is not aware of "the lack of contemporaneous reclamation at the mine," or any documentation concerning the reclamation procedures leading to "the spread of noxious weeds and reduced acreage for livestock and wildlife habitat," and "reduced air quality" due to

7

improper reclamation practices. The mine's annual Monitoring Report (on file with the WDEQ in Sheridan, Wyoming) goes into detail on stock and wildlife grazing areas and noxious weed control.

The Surface Mine Control and Reclamation Act (SMCRA) is the federal law regulating surface coal mining. BLM has no authority under SMCRA to prescribe or enforce the reclamation of coal-mined lands in Wyoming. The WDEQ, Land Quality Division (LQD) permits, regulates, and monitors coal mining and reclamation. Three acts regulate coal mining and reclamation in Wyoming: 1) Wyoming's Open Cut Reclamation Act of 1969; 2) Wyoming State Environmental Quality Act of 1973; and, 3) the federal act, SMCRA. The state of Wyoming has the overall authority and enforces these federal and state acts through the WDEQ/LQD.

As thoroughly detailed in the "Reclamation Activities" section of the EIS, the WDEQ statutory and regulatory requirements outline strict parameters for coal-mine reclamation procedures, species composition, final land surface contour, and environmental sustainability. The SMCRA requires sufficient bonding to cover anticipated reclamation costs. When mining is permitted, the WDEQ/LQD sets the bond amount for reclamation of all disturbed lands, and the operator posts an acceptable bonding instrument for this amount with the state of Wyoming. The reclamation bond is not released until a minimum of 10 years have elapsed from the date of final seeding, and the WDEQ/LQD has determined that all reclamation verifications have occurred.

The WDEQ/LQD monitors monthly all lands within the mining permit boundary, and these lands must pass requirements set by state law beyond the mine's termination of their permit. The WDEQ does not require the mines to complete final bond release as long as contemporaneous reclamation is proceeding at the required rate and to the required standards set by state and federal laws and reclamation has met permit standards. A percentage assessment of lands that have been released from final bonding requirements is not an accurate assessment of contemporaneous reclamation.

In the interim between initial reclamation and final bond release, condition and status of the lands are monitored by the WDEQ/LQD, and that information is publically available from their Cheyenne office. Reclaimed lands, regardless of the bond release status, are used by wildlife and often grazed by livestock (regulated and monitored by the WDEQ).

Tables 4-2 and 4-3 in the EIS summarize actual and projected disturbance and reclamation through 2020. The total disturbance (including active mining and mined but unreclaimed, as well as disturbed but unavailable for reclamation, due to being occupied by long term structures or facilities) as well as areas permanently reclaimed is displayed. The trend is that the acreage (including active mining and mined but unreclaimed) is expected to increase slowly, less than one percent per year, as is the acreage of land disturbed but unavailable for reclamation. The rate of permanent reclamation will be more rapid (about 4% per year). The ratio of total land reclamation to total land disturbance was around 30% in 2003, and is expected to be 45% by 2010, and approaching 60% by 2020. As of 2008, the actual ratio of total land reclamation to total land disturbance was about 45% (29,100 acres permanently reclaimed out of a total disturbance of 64,100 acres) for the Wyoming PRB mines. Of the total unreclaimed disturbance, about 23,000 acres were unavailable for reclamation (stockpiles, facilities, and sediment control) and 35,000 acres were in active mining operations (active pits and haul roads).

We believe the comment may be incorrectly equating contemporaneous reclamation with final bond release. There is a difference between lands that are in various stages of reclamation and those that have been reclaimed and released from final bonding requirements. Several phases of bond release the mine operators may apply for represents every task from replacing the backfill, to the approved contour, to placing topsoil, and permanent seeding. Final bond release on reclaimed lands indicates that the reclamation meeting permit standards has been in place for at least 10 years and that an application for final bond release was submitted to WDEQ.

Reclamation plans are submitted during the permitting process for approval by the WDEQ. These plans are based on the individual mining company's mining progression. The WDEQ approves or rejects these plans based on the mining progression of the individual mine and the space needed for long-term facilities, sedimentation reservoirs, haul roads, diversions, and topsoil stockpiles. The reclamation plan is evaluated against the individual mine progression by the WDEQ to ensure reclamation is directly following the mining extraction process.

D) Analyze and Mitigate Impacts to Groundwater Quantity

Water resources specific to the Hay Creek II study area are covered in section 3.5, with groundwater being specifically covered in section 3.5.1. The Buckskin Mine's annual report discusses water issues within the mine permit boundary. There is also a cumulative water modeling study, completed by BLM as part of the Powder River Basin Coal Review that provides further information on how surface and groundwater resources have been and would be affected by regional development activities. This report, completed in December 2009, can be found on the BLM Wyoming web site at http://www.blm.gov/wy/st/en/programs/energy/Coal_Resources/PRB_Coal/prbdocs.html

The SMCRA and Wyoming state law require that the surface coal-mine operator provide the owner of the affected water right with water of equivalent quantity and quality.

For the purposes of identifying and disclosing potential impacts, the FEIS assumes that: 1) the LBA is offered for lease, 2) that the successful lessee is the applicant mine, and 3) that the mine applies for, and is granted, a permit to mine the LBA in a manner similar to mining already permitted on other lands at the applicant mine. The EIS includes an evaluation of these potential impacts in chapter 3 (sections 3.5, 3.6, and 3.7) and in chapter 4 (sections 4.2.4.1, 4.2.5, and 4.2.6).

Under SMCRA and Wyoming law, a number of specific studies would be done. The results of those studies would be the deciding factor as to whether or not a permit to mine any lands that might be leased in the Hay Creek II LBA would be approved. At that time, the specific plan to develop the LBA would be known. The WDEQ/LQD would develop a cumulative hydrologic impact assessment (CHIA) to look at how mining the LBA, along with any other already approved mining, would affect groundwater and the recharge contribution. Also a system of wells to monitor groundwater would be specified. The management of surface water flows during mining, as well as the restoration of surface water flow systems post mining would be specified in any mining permit to develop the LBA, if leased.

The EIS includes a thorough evaluation of water resources in section 3.5, 4.2.4, and 4.2.5. Please review these sections, and in particular, see section 4.2.4.1 for the groundwater cumulative impact analysis which includes coalbed methane/natural gas development.

7

E) Analyze and Mitigate Climate Change Impacts

The EIS discloses the potential effects to the natural and human environment from the proposed leasing of a tract of subsurface coal which will be used to maintain production at the Buckskin mine in the PRB of Wyoming. Although leasing this tract would not authorize mining operations on the tract, the EIS evaluates the potential impacts of mining because it is a logical consequence of issuing a lease for a maintenance tract of coal. The EIS assesses the site-specific impacts resulting from a range of alternative actions to the proposed action of leasing a specific tract of land. The EIS also assesses the cumulative impacts on the environment, which results from the incremental impact of the proposed LBA when added to other past, present, and reasonably foreseeable future actions that would add to the impact of the proposed action.

Climate change as it relates to coal mining is addressed in chapter 3 (section 3.18.3), and in chapter 4 (section 4.2.14.1) as it relates to coal mining and coal use. In chapter 4, the contribution of the site-specific alternatives to cumulative effects on the environment is evaluated. To do this, we assume that coal mining will proceed in accordance with permit conditions and that coal from the Buckskin Mine will be sold on the open market. We further assume that this coal will be sold to coal users in response to forecasts of demand for this coal. Historically these users have been electric utilities in the United States, although there is potential for sales outside the US. This coal market is open and competitive, and users can buy from the most cost-effective suppliers that meet their needs.

Section 4.2.14.1 and section 4.2.14.2 of the FEIS provide estimates of the amount of GHG emissions that could be attributed to coal production because of leasing the proposed LBA, as well as from the forecast coal production from all coal mines in the Wyoming PRB. We assumed that all PRB coal was used for coal-fired electric generation as part of the total US use of coal for electric generation. This gives an upper estimate of the GHG resulting from using the coal produced from the proposed LBA and for forecast total PRB coal production. The estimate was calculated by relating the portion of coal produced in the Wyoming PRB to national steam coal totals, and then applying that ratio to the total emission of GHG estimated in the US from coal-fired electric generation.

Additionally the EIS states that policies regulating specific levels of significance have not yet been established for GHG emissions. Given the state of the science, it is not possible to associate specific actions with the specific global impacts such as potential climate effects. Since there are no tools available to quantify incremental climate changes associated with these GHG emissions, the analysis cannot reach conclusions as to the extent or significance of the emissions on global climate. The potential impacts of climate change represent the cumulative aggregation of all worldwide GHG emissions. The EIS provides a meaningful context and measure of the relative significance of coal use from a lease under the Proposed Action and alternatives and overall projected PRB coal production on total GHG emissions.

The use of carbon-based fuels as a primary fuel for electric generation results in the release of a large quantity of CO_2, a greenhouse gas, as estimated and disclosed in the EIS. A large portion of our existing domestic electric generating capacity is designed for carbon fuels. While there is presently substantial interest and potential public policy and regulation to move from carbon fuels for electric generation, the demand for electric power is not forecast to decrease.

Focus is on the amount of CO_2 resulting from the historic burning of PRB coal as though any continuation of PRB coal use would be a new impact, and thereby significant. The EIS states that the continued release of CO_2 for electric generation is uncertain, and depends on economics and future regulation of coal users. Further, the assumed mining and use of this coal in the future depends on sustained, but uncertain, demand for PRB coal and coal in general. The EIS applied published forecasts of coal use to establish the likely continuation of coal for electric generation into the foreseeable future. On this basis, it is forecast that there would be some reduction in coal-fired electric generation, which may or may not affect the historic ratio of PRB coal in the national or international market.

The EIS addresses the environmental effects of leasing coal and the logical result that the coal is mined by an operator of an existing, adjacent mine. The EIS further discloses the indirect emissions based on the presumption the mined coal is burned to produce electricity. The EIS does not address regulation of GHGs or set standards for carbon fuel use. In a regulatory structure where GHG control costs factor into electric generation costs, coal users would likely weigh these costs into capital and operating decisions. Electric generation activity is directly influenced by consumer demand. If electricity cannot be supplied to meet demand, power prices rise until the demand falls. Measures to reduce GHG emissions from coal burning are applied where the coal is consumed, because the coal consumer must comply with regulatory and price constraints, which will bear on fuel choices. Infrastructure, equipment availability, incentives, and cost also determine the potential for switching to noncarbon-based electric generation. Mining the leased coal and the continued operation of a Powder River Basin mine is not directly tied to any existing or proposed electric generation facility. Limiting one or even several points of fuel supply will not affect coal use because of the diverse group of national and international suppliers.

The effects of black carbon as a particulate are included in the discussion of the effects of particulates on air quality. State-enforced mitigation procedures for the effects of black carbon are already in place at coal mines and coal combustion facilities.

The FEIS recognizes the effects of historic warming on the western US. We have assumed that existing land and resource conditions within the analysis area have been and will continue to be affected by climate change under all alternatives including the No Action Alternative. Existing climate prediction models are not at a scale sufficient to estimate potential impacts of climate change within the analysis area. We have referenced available national and regional data, most recent being the report, The Effects of Climate Change on Agriculture, Land Resources, Water Resources and Biodiversity in the United States (US Climate Change Science Program 2008). A recent report, Global Climate Change Impacts in the United States, defined the relative degree of climate change effects that could be experienced in the future in the various regions of the United States. (Karl et al. 2009). The report uses two scenarios to bracket potential climate effects and is broken into regions which divide up the US. The Wyoming PRB is in the Great Plains region, which is characterized by strong seasonal climate variations. Historically the area has been subject to prolonged drought followed by wetter conditions. Average temperature increases have been predicted in the region with the greatest changes being in the winter such that commonly very cold days would become less common and warmer wetter weather more common. Under the higher heat trapping emission scenario temperatures are projected to increase over the next 100 years more so than under the lower heat trapping emission scenario. The milder winters and

longer growing season is expected to favor larger numbers of insects that appear earlier and persist longer into the season. The change in climate is expected to cause a shift in wild plant and animal distributions favoring those species which are better suited for the warmer wetter climates that both the lower emission and higher emission scenarios predict for the Powder River Basin. With increasing precipitation, soil erosion in drainages and sheet flow across the land surface is expected to increase.

BLM recognizes that methane or CBNG is a valuable energy resource, and has policies encouraging methane development, where economically feasible, in advance of coal mining. The analysis in the EIS (section 3.3.2.1) states that CBNG has been commercially produced in the PRB since 1989. The document goes on to say that coal seams were already substantially depleted of CBNG in the vicinity of the mines in 2000 as a result of mining. By 2005, drilling activity in the areas adjacent to the coal mines declined significantly, and little to no interest has occurred in this area since.

Methane was identified as a GHG in the section (4.2.14.1) on climate change and global warming. The potential release of methane as a direct result of mining and other activities in the PRB has been discussed. The EIS gives estimates of GHG emissions resulting from specific operations at the Buckskin Mine as projected under the proposed action and alternatives over the life of the lease. The projections reflect general mining activity in the PRB region and specific estimates derived by CO_2e foot printing of the Buckskin Mine operation.

Surface mines vent methane to the atmosphere in varying amounts as the coal is exposed, depending on the amount of methane extraction that has occurred or is occurring in advance of mining. We have recognized that large volumes of methane have been recovered in advance of mining, and that by the time the coal is mined, methane in commercial quantities has been depleted. The calculated amount for methane release at the Buckskin Mine's exposed coal face is included in the FEIS CO_2e calculations.

Pre-mining drainage of coal seam gas in front of surface mines in the Powder River Basin by CBNG operators is a common practice where the geology is favorable and gas is present in sufficient quantities. Less common is the pre-mine drainage of non-commercial methane and/or flaring of low quality gas as a part of emission reductions (ER) programs. Such programs might be supported by protocols adopted by a voluntary carbon market registry, like the voluntary carbon standard (VCS). A flaring project provides the benefit of destroying large volumes of potent greenhouse gas (methane) and releasing the much weaker by-product of combustion (carbon dioxide). The economics to sustain an ER flare project are solely based on the revenue received by the operator from the resulting sale of carbon offset credits in the voluntary market. Consequently, project financing is determined based on future market pricing for carbon credits. For example, estimates for a prospective flare ER project at the North Antelope Rochelle Mine require a price greater than \$4.00/ton CO_2e, just to cover development and operating costs.

In order to qualify for carbon credits in the voluntary carbon market, among other things, a project must meet two essential requirements. First, the project must be voluntary (i.e. not be required by applicable law or regulation), and second the project must overcome one or more financial, technological, or institutional barriers to its implementation (as defined by the applicable carbon registry).

Several factors must be in place before a pre-mine drainage of non-commercial methane gas project (such as a flare project) can be implemented.

- The geologic conditions for eligible mining operations must favor the presence and retention of coal seam gas. At many of the active mining operations in the Powder River Basin, the major coal seams are interrupted by faulting, ribbon splits, or the presence of paleolithic sand channels which have removed part or all of the coal seam in limited zones in the active mine and proposed lease areas. At the Buckskin Mine, for instance, there are significant sand channels present within and surrounding the mine. These discontinuities in the coal seam have had the effect of "drying" the coal seam locally. This means that the methane was naturally released from the coal seam in the distant past, and there is little gas remaining to be captured from the impacted area. Where commercially recoverable methane did exist, it has already been removed by CBNG operators working the Hay Creek II LBA general analysis area and by methane operators working out in front of the mining operations in the PRB.
- If gas remains in sufficient quantities for flare project operations, the mine operator must be able to obtain land and mineral use authorizations for the remaining non-commercially recoverable methane.
- The quality and quantity of the methane gas within the coal seam must be considered. In some cases there is not enough methane gas remaining after CBNG operators have completed their operations to support flaring. Further, methane may be present in sufficient quantities to support an ER operation, but has been so contaminated by introduction of air (nitrogen) that it will not support combustion without assistance, making it costly and impractical to flare.

Oil, gas, and coal leases are subject to different regulations, depending on whether the leases are state, federal, or privately owned. Some action has been taken authorizing development and operation of flare ER projects on state regulated minerals. On federally regulated minerals, the regulatory framework necessary to support flare ER operations has not yet been developed.

Flaring is not reasonable at the Buckskin Mine, because:

- The federal gas leases on lands in the Hay Creek II LBA study area cannot be permitted for methane flaring. This condition, therefore, is not met.
- The Buckskin Mine must own the oil and gas rights associated with any methane under consideration and have the requisite infrastructure in place to operate a flaring project. This condition is not met.
- The Hay Creek II LBA does not contain state or fee coal.

At the Buckskin Mine, the requirements for flaring methane currently cannot be met.

Managers of coal and oil/gas (including CBNG) at the BLM Wyoming State Office and the Buffalo Field Office are aware of the issue regarding venting of methane vs. the flaring of methane in order to reduce CO_2e on federal coal leases before mining.

F) Analyze Impacts from Coal Burning Such as Mercury and Combustion Waste Disposal

The EIS addresses mercury and combustion waste disposal in a cumulative context in chapter 4 (4.2.14.5). There is only one mine in the Wyoming PRB currently accepting coal combustion by-products from coal mined on site. The Buckskin mine is not permitted to dispose of coal combustion by-products and so does not accept them.

G) White Energy Coal Drying Proposed Project

White Energy Coal North America, Inc. (WECNA) a U.S. subsidiary of White Energy Company Limited based in Sidney, Australia has proposed the facility. Buckskin anticipates leasing property and an access right-of-way to WECNA. The mine also proposes to sell coal to the White Energy facility should they meet market value. Final negotiations have yet to be completed. Since the mine is not proposing the project, they are neither responsible for the permitting applications associated with the project nor do they have access to any of the data required to conduct an analysis of the proposed project for this EIS.

White Energy is responsible for all permitting associated with this project. The company is in the process of developing a CO_2e footprint for the facility.

WDEQ received an application for the project on December 3, 2010. The White Energy project is solely under the jurisdiction of the WDEQ and information concerning it can be found through the WDEQ.

The proposed Ambre facility in Montana (if this is the facility referred to in the comment) is not similar to White Energy's proposal. The Ambre facility is a coal to liquids process, which is quite different from White Energy's proposal of a coal drying to briquettes process proposed at the Buckskin Mine.

The facility proposed by White Energy is not in any way connected to the Hay Creek II lease or dependent upon it. Regardless of whether the Hay Creek II tract is offered for lease, and regardless of the BLM preferred tract configuration should BLM offer a tract, the White Energy proposed facility is expected to succeed or fail of its own accord.

Correction: Kiewit does not have a proposed coal drying facility. White Energy Coal North America, inc. has proposed a coal drying facility on surface owned by Buckskin Mine. If such a facility is built it is proposed to be outside the mine's permit area.

H) DM&E Railroad

The paragraph in section 4.1.1.2 discussing the DM&E rail line is accurate. The decision is still contingent on the listed conditions. The eminent domain suit does not change the facts presented. No changes will be made to the paragraph.

I) Wygen III Addition to EIS

Wygen III has been added to the discussion in section 4.1.1.2.

J) Two Elk Unit #2

North American Power Group (NAPG) has had permits for Two Elk Unit #1 since 1997, but has yet to construct any facilities. Wyoming Power Company (a subsidiary of NAPG) has a proposal for Two Elk Unit #2, a new project. Some paperwork had been filed with the WDEQ/AQD,

which was returned in March 2010. We have found no further formal information available. The paragraphs on Two Elk units #1 and #2 have been modified in section 4.1.1.2 the final EIS to reflect currently known information. Thank you.

8

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
5353 Yellowstone Road, Suite 308A
Cheyenne, Wyoming 82009

MAY 0 3 2010

COPY

In Reply Refer To:
ES-61411/WY10CPA0111
Memorandum

To: Environmental Protection Specialist, Bureau of Land Management, High Plains District Office, Casper, Wyoming,

From: for Field Supervisor, U.S. Fish and Wildlife Service, Wyoming Field Office, Cheyenne, Wyoming Scott Hicks

Subject: Comments for the Buckskin Mine Hay Creek II Coal Lease Application Draft Environmental Impact Statement

Thank you for your letter dated March 3, 2010, received in our office on March 16, regarding the Draft Environmental Impact Statement (DEIS) for the Buckskin Mine Hay Creek II Coal Lease Application in northern Campbell County, Wyoming. This tract is located northwest and immediately adjacent to the existing Buckskin Mine. This DEIS assesses the environmental consequences of the competitive, sealed bid sale and lease for the federal coal reserves included in the proposed tract to Kiewit Mining Properties, Inc. The U.S. Fish and Wildlife Service (Service) previously provided scoping comments to the Bureau of Land Management on September 24, 2008, (WY08FA0200) on the Hay Creek II Lease Application. In response to your request for our review of the DEIS, the Service is providing the following comments.

General Comments

The DEIS should be updated to reflect the current status of sensitive, threatened, and endangered species within the project area (see http://www.fws.gov/wyominges/PDFs/CountySpeciesLists/Campbell-sp.pdf for current species information).

Greater Sage Grouse: The Service has determined that the greater sage-grouse warrants listing under the Act (75 FR 13910). At this time, the development of a listing proposal is precluded by other higher priority listing actions. Candidates are reviewed annually to determine if they continue to warrant listing or to reassess their listing priority. Ideally, sufficient threats can be removed to eliminate the need for listing in which case sage-grouse would no longer be a candidate. If threats are not addressed or the status of the species declines, a candidate species can move up in priority for a listing proposal.

8

Greater sage-grouse are dependent on sagebrush habitats year-round. Please see our Federal Register notice on sage-grouse for detailed information concerning the status of the species (75 FR 13910). Habitat loss and degradation, as well as loss of population connectivity, have been identified as important factors contributing to the decline of greater sage-grouse populations rangewide. Therefore, any activities that result in loss or degradation of sagebrush habitats that are important to this species should be closely evaluated for their impacts to sage-grouse. If important breeding habitat (leks, nesting or brood rearing habitat) is present in the project area, the Service recommends no project-related disturbance March 15 through June 30, annually. Minimization of disturbance during lek activity, nesting, and brood rearing is critical to sage- grouse persistence within these areas. Likewise, if important winter habitats are present, we recommend no project-related disturbance November 15 through March 14. B

We recommend you contact the Wyoming Game and Fish Department to identify important greater sage-grouse habitats within the project area, and appropriate measures to minimize potential impacts from the proposed project. C

The Service recommends surveys and mapping of important greater sage-grouse habitats where local information is not available. The results of these surveys should be used in project planning, to minimize potential impacts to this species. No project activities that may exacerbate habitat loss or degradation should be permitted in important habitats. D

Mountain Plover: The Service has agreed to reopen the comment period in 2010 on the proposed rule to list the mountain plover as a threatened species (67 FR 72396, December 5, 2002) and to complete a new final determination on the proposal by May 1, 2011. Once the comment period is reopened and pending the completion of the new final determination, the mountain plover will be proposed for listing. Section 7(a)(4) of the Act, requires Federal agencies to confer with us on any action that is likely to jeopardize the continued existence of any species proposed for listing. Federal action agencies may also request a conference on any proposed action that may affect a species proposed for listing.

We encourage project planners to develop and implement protective measures should mountain plovers occur within project areas. Measures to protect the mountain plover from further decline m[illegible] clude: (1) avoidance of suitable habitat during the plover nesting season (April 10 through Jul[illegible]), (2) prohibition of ground disturbing activities in prairie dog towns, and (3) prohibition of any permanent above ground structures that may provide perches for avian predators or deter plovers from using preferred habitat. Suitable habitat for nesting mountain plovers includes grasslands, mixed grassland areas and short-grass prairie, shrub-steppe, plains, alkali flats, agricultural lands, cultivated lands, sod farms, and prairie dog towns. We strongly encourage you to develop protective measures with an assurance of implementation should mountain plovers be found within the project areas. A E

Specific Comments

8

Chapter 3: Chapter 3 is missing a section for threatened, endangered, proposed, candidate, and BLM sensitive plant species, and therefore is missing a discussion of Ute ladies'-tresses *(Spiranthes diluvialis)*, blowout penstemon (*Penstemon haydenii*), and BLM sensitive plant species. F

Section 3.10.5.2 Raptors, Environmental Consequences (p. 3-118 and 3-119): This section states that the Buckskin Mine has a Service-approved raptor mitigation plan in place for the existing permit area and that the plan would be revised during the permitting phase to accommodate the proposed tract. We understand that the current Raptor Mitigation Plan for Buckskin Mine will expire in 2010, and that the new area has not been included in the Plan. Specifically, raptor nest locations and status should be updated, and the effective date should extend beyond 2010. Since the DEIS evaluates the consequences to nesting raptors and uses mitigation and protections from the Buckskin Mine Raptor Mitigation Plan, the Service recommends that the Raptor Mitigation Plan be updated as soon as possible, to adequately evaluate the effects to raptors in the area. G

Section 3.10.10 Regulatory Compliance (p.3-147): The DEIS states "restoring sage-grouse habitat after mining including reestablishment of sagebrush and other shrubs on reclaimed lands and grading reclaimed lands to create swales and depressions…". At the end of the sentence, we recommend adding "consistent with the pre-mining topography." H

Appendix I (p.I-4, p.I-17): Black-footed ferrets (*Mustela nigripes)* are no longer listed on the Campbell County Species List and would not need to be addressed in the Biological Assessment. I

Appendix I (p.I-6): The DEIS refers to the "required use of raptor-safe power lines" and "minimizing electrocution hazards to raptors". We recommend adding the citation "APLIC (2006)" to refer the reader to the specific measures to avoid impacting raptors. J

Thank you for the opportunity to comment on the Hay Creek II DEIS. We look forward to reviewing the EIS and biological assessment prior to finalization. Please feel free to contact our office at any time to discuss issues or concerns regarding this proposed coal lease. If you have any questions regarding this letter, please contact Pauline Schuette at (307) 684-1069.

cc: BLM, Threatened and Endangered Species Coordinator, Cheyenne, WY (T. Abbott)
WGFD, Statewide Habitat Protection Coordinator, Cheyenne, WY (M. Flanderka)
WGFD, Non-Game Coordinator, Lander, WY (B. Oakleaf)

8

References

Avian Power Line Interaction Committee (APLIC). 2006. Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Edison Electric Institute, APLIC, and the California Energy Commission. Washington, D.C. and Sacramento, CA. 207pp.

Braun, C.E. 1998. Sage grouse declines in western North America: What are the problems? Proceedings of the Western Association of Fish and Wildlife Agencies 78:139-156

Wisdom, M.J., B.C. Wales, M.M. Rowland, M.G. Raphael, R.S. Holthausen, T.D. Rich, and V.A. Saab. 2002. Performance of Greater Sage-Grouse models for conservation assessment in the Interior Columbia Basin, USA. Conservation Biology16: 1232-1242.

BLM RESPONSES TO COMMENT LETTER 8

8

A) Updated Species Status

The status of threatened, endangered, candidate, and proposed species has been updated in the final EIS as requested by biologist Pauline Schuette, U.S. Fish and Wildlife Service (FWS), Wyoming Ecological Services Field Office, Buffalo, Wyoming.

B) Sage-grouse and Sagebrush

BLM understands and agrees that sage-grouse need to receive protection as set by the U.S. Department of the Interior and the state of Wyoming. Sections 3.10.6.1 ("Affected Environment") through 3.10.6.2, ("Environmental Consequences") in the final EIS contain a thorough discussion on upland game birds, particularly sage-grouse in the Hay Creek II LBA general analysis area. Given the dominant vegetation types in the general analysis area (upland grasslands and agricultural fields), and the lack of regular sightings over the last 26 years of monitoring, especially outside the breeding season, it is unlikely that either the sharp-tailed grouse or the sage-grouse is a yearlong resident.

C) Wyoming Game and Fish Department

The Wyoming Game and Fish Department (WGFD) was contacted at the beginning of the EIS process and invited to be a cooperator but declined that opportunity. The agency was also contacted and consulted on this project during scoping, again during the draft document review process, and will be sent the final document for review. In a letter to the BLM, dated May 6, 2010, the WGFD stated that it has no concerns about terrestrial or aquatic species pertaining to the Hay Creek II LBA coal lease application.

D) Surveying and Mapping Greater Sage-grouses Habitat

Greater sage-grouse habitats within the EIS general analysis area and for several miles outside the general analysis area have been mapped, plotted, reviewed, and analyzed for all vegetative communities, including sagebrush and other important habitats.. Please see section 3.10.6 ("Upland Game Birds"), and appendix J ("Biological Assessment") for sage-grouse discussions.

Due to its proximity to the existing Buckskin Mine permit area, the southern third (33%) of the general analysis area was included in annual wildlife surveys for sage-grouse from 1984 through 2001. Approximately 95% of the general analysis area was surveyed annually from 2002 through 2006 in conjunction with a previous permit amendment at the mine. The entire (100%) general analysis area and additional lands within 2.0 miles of that area were included in targeted baseline surveys conducted for the Hay Creek II EIS from late 2007 through 2010. All baseline and annual monitoring reports for the Buckskin Mine are part of the public record and are available at the Sheridan WDEQ office. All such reports and surveys have been used in the sage-grouse evaluation in this EIS.

E) Mountain Plover Protective Measures

Please see section 3.10.7.1 and section 3.10.10 of the EIS. No mountain plovers have been documented in the general analysis area during wildlife monitoring conducted for the Hay Creek II tract or the adjacent Buckskin Mine through 2010. Nevertheless, the existing Buckskin Mine permit document already includes species-specific protective measures for the mountain plover.

Should the mine acquire the Hay Creek II coal lease, all existing species-specific protective measures and monitoring and mitigation requirements for mountain plovers and other species of concern would automatically be applied to all newly leased and permitted lands.

The BLM does not issue permits for surface disturbance activity for coal mining, nor does the BLM manage mine operations or approve mitigation measures for animal species on private lands in Wyoming being considered for subsurface coal leasing. The WDEQ and the Office of Surface Mining Reclamation and Enforcement (OSM) issue permits and approve mitigation and monitoring measures for coal mining based on input from the FWS and WGFD. Therefore, assurance of implementation of species-specific protective measures and monitoring and mitigation requirements would be the responsibility of these agencies during their review of annual monitoring reports and periodic renewals of avian monitoring and mitigation plans. However, mountain plovers have been addressed in a memorandum from the FWS to BLM's Wyoming State Director (April 5, 2007), available at http://www.blm.gov/style/medialib/blm/wy/wildlife/mtnplover.Par.50309.File.dat/finalMountainPlover.pdf as well as in the Final Report: Mountain Plover (Charadrius Montanus) Biological Evaluation and the Species Assessment for Mountain Plover (Charadrius Montanus) in Wyoming (Smith and Keinath 2004) Both documents are available at http://www.blm.gov/wy/st/en/programs/Wildlife/mtn-plover.html.

F) Missing Sensitive Plant Species Discussion

A summary of the discussion in appendix K has been summarized as section 3.9.3 in chapter 3 of the final EIS.

G) Raptor Mitigation Plan for Buckskin Mine

The text for raptors in sections 3.10.5.2 ("Affected Environment") and section 3.10.10 ("Regulatory Compliance, Mitigation and Monitoring") has been revised to clarify that the current FWS-approved avian monitoring and mitigation plan for the Buckskin Mine would be updated. The update would incorporate mitigation measures to minimize impacts to nesting raptors prior to any new disturbance associated with new leasing actions, if the tract is offered for lease and if Buckskin mine is the lessee. This, of course, depends on whether the tract is offered for lease and if Buckskin Mine were the lessee Raptor mitigation would be addressed as part of a mine permit regardless of the lessee.

H) Edit

The sentence has been edited as requested.

I) Black-footed Ferrets

Although the black-footed ferret is no longer included on the Campbell County list of threatened and endangered species, it remains as a federally listed species. Therefore, this species is addressed in Appendix J ("Biological Assessment") of the EIS, as per BLM policy.

J) Citation Recommendation

The citation "APLIC (2006)" has been added to page J-7 of the Biological Assessment (appendix J of the final EIS) and a full reference has been added to page J-37.

9

Brenda J Johnson <bjjohnso@usgs.gov>
04/20/2010 08:53 AM
To
Hay_Creek_II_WYMail@blm.gov
cc
Gary D Lecain <gdlecain@usgs.gov>
bcc

Subject
Wyoming Powder River Basin

Teresa Johnson,

The USGS has reviewed the Draft Environmental Impact Statement for the Wyoming Powder River Basin at the Buckskin Mine in Campbell County and has
no comments.
Thanks

Brenda

****
Brenda Johnson
Environmental Management Branch (EMB)
Administrative Assistant
U.S. Geological Survey Mail Stop 440
Room 5A326
12201 Sunrise Valley Dr.
Reston, VA 20192
Tele (703) 648-6832
Fax (703) 648-5644
bjjohnso@usgs.gov
****

BLM RESPONSES TO COMMENT LETTER 9

9

Thank you very much for taking the time to review the Buckskin Mine Hay Creek II Draft EIS.

10

WILDEARTH GUARDIANS
A FORCE FOR NATURE

May 11, 2010

Wyoming High Plains District Office
Bureau of Land Management
Attn: Teresa Johnson
2987 Prospector Drive
Casper, WY 82604

Re: Hay Creek II Coal Lease Draft EIS Comments

Dear Ms. Johnson:

WildEarth Guardians submits the following comments on the Buckskin Mine Hay Creek II Coal Lease Application Draft Environmental Impact Statement ("DEIS"), which was prepared pursuant to the National Environmental Policy Act ("NEPA"). The DEIS analyzes the impacts of the Bureau of Land Management's ("BLM's") proposal to offer a coal lease-by-application ("LBA") that would allow Kiewit Mining to strip mine as much as 149.7 million tons of coal from the Powder River Basin of northeastern Wyoming (hereafter "Hay Creek II LBA"), leading to a number of environmental impacts, including the release of more than 273 million tons (248 million metric tons) of carbon dioxide ("CO_2"), a heat trapping greenhouse gas that is fueling global warming, once the leased coal is mined and burned. *See* Table below.

Proposed LBA Acreage, Tonnage, CO_2 Emissions, and Mine Company Proponent.[1]

Lease by Application	Acreage	Tons of Coal	Tons of Carbon Dioxide from Burning	Mine Company Proponent
Hay Creek II	1,883.1	149,700,000	273,834,234	Kiewit Mining Properties

The proposed action, particularly when combined with other coal leases in the Powder River Basin of Wyoming, is significant. Indeed, the BLM is offering to lease such a large amount of coal notwithstanding a growing body of knowledge pointing to human-caused releases of greenhouse gases, like carbon dioxide, as key drivers of global warming. Global warming is dramatically changing the climate, threatening economic stability, national security, public health, and natural ecosystems. In recognition of the need to confront global warming, a number

[1] Acreage and tonnage figures based on DEIS. CO_2 emissions based on BLM's methodology of calculating emissions using an emission factor of 212.7 pounds of CO_2 per million Btu and an average Btu value of 8,600 per pound of coal. *See* DEIS at 4-113.

1536 Wynkoop Street, Ste. 301 Denver, CO 80202 303-573-4898 www.wildearthguardians.org
SANTA FE DENVER PHOENIX

10

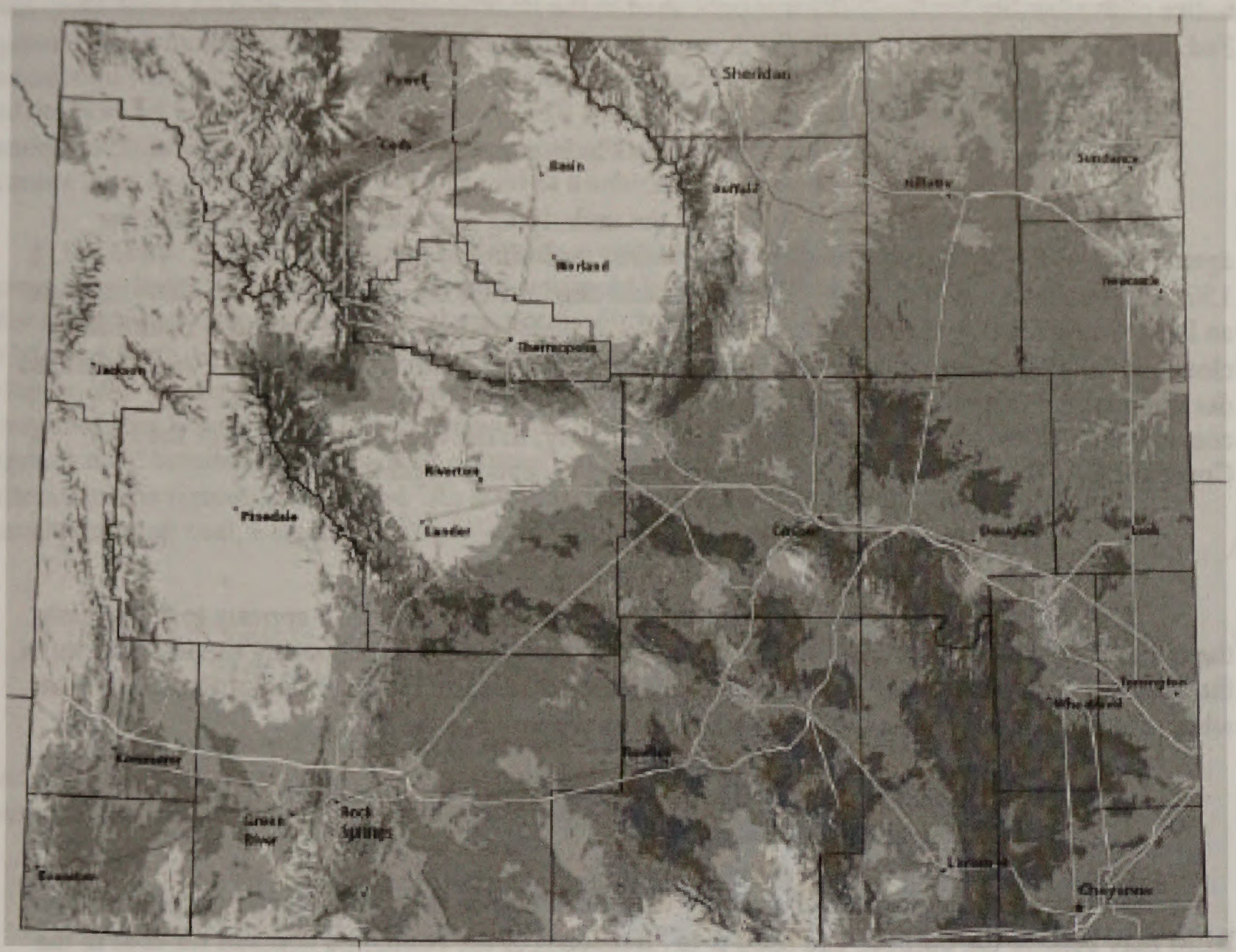
of states in the American West, including Colorado and New Mexico, have adopted ambitious greenhouse gas reduction goals.[2] Even the U.S. Environmental Protection Agency ("EPA") has found that, "[G]reenhouse gases in the atmosphere may reasonably be anticipated to both endanger public health and to endanger public welfare." 75 Fed. Reg. 66496, 66497 (Dec. 15, 2009).[3] In making its final determination that greenhouse gases, including CO_2, pose an endangerment to public health and welfare, the EPA found, "that the body of scientific evidence compellingly supports this finding." *Id.*

Not only that, but the BLM is offering to lease such a large amount of coal in a day of age where clean, renewable energy is becoming more affordable and widely available. Even Secretary of the Interior Ken Salazar has recognized this and directed that, "Encouraging the production, development, and delivery of renewable energy is one of the [Interior] Department's highest priorities." Secretarial Order No. 3285 (March 11, 2009). In the State of Wyoming, this direction could not be more imperative. The wind energy potential in Wyoming along is estimated to be 883 million megawatt-hours/year ("MWh/y"), enough to more than meet the energy demands of the entire American West. *See* Figure below. Given that much of Wyoming's wind energy potential located on public lands managed by the BLM, it is unbelievable that the BLM would propose lease more than 4 billion tons of coal in the Powder River Basin. At the least, it is unclear how the agency is addressing the Interior Secretary's directive in Secretarial Order No. 3285 by proposing the Hay Creek II LBA.

[2] *See* **Exhibit 1**, greenhouse gas reduction Executive Order signed by Colorado Governor Bill Ritter and **Exhibit 2**, greenhouse gas reduction Executive Order signed by New Mexico Governor Bill Richardson.

[3] *See* EPA, ENDANGERMENT AND CAUSE OR CONTRIBUTE FINDINGS FOR GREENHOUSE GASES UNDER SECTION 202(A) OF THE CLEAN AIR ACT; FINAL RULE (December 15, 2009), *attached as* **Exhibit 3**.

10



Wind Energy Potential in Wyoming. Blue is "Superb," red is "Outstanding," purple is "Excellent," pink is "Good," and orange is "Fair."[4]

The BLM's proposal appears wholly out-of-touch with the current state of science, the range of energy alternatives available, and with Interior Department policy. As such we do not support the proposed Hay Creek II LBA and urge the BLM to reject offering the proposed lease. We are very concerned that the agency is not fully addressing the global warming impacts of the proposed LBA, nor is the agency addressing the need for renewable energy. Further, we have serious concerns that the BLM is illegally leasing coal under the LBA process, thereby preventing the agency from fully analyzing and assessing the environmental impacts of regional coal leasing in the Powder River Basin and from providing the public a full opportunity to comment on regional leasing levels. We are further concerned that the BLM has not addressed serious air quality impacts, has not analyzed a range of reasonable alternatives, and has failed to address other impacts associated with the Hay Creek II LBA in the DEIS. In accordance with the BLM's notice regarding the availability of the DEIS (*see* 75 Fed. Reg. 11906-11907 (March 12, 2010)), these comments are timely submitted within 60 days of March 12, 2010, the date the

[4] Map from Renewable Energy Atlas of the Western States. *See* **Exhibit 4**.

notice of availability for the DEIS was published in the Federal Register by the EPA. *See* 75 Fed. Reg. 11882 (March 12, 2010) (EPA providing notice of availability of DEIS).

10

1. The Purpose and Need for the DEIS is Unclear and Appears too Narrow

An EIS is required to "briefly specify the underlying purpose and need to which the agency is responding in *proposing the alternatives including the proposed action*." 40 C.F.R. § 1502.13 (emphasis added). Thus, the purpose and need drives the development of alternatives in an EIS. Consequently, it is imperative under NEPA that a stated purpose and need in an EIS be clear, not be so narrow as to preclude reasonable alternatives, and above all ensure well-informed decisionmaking that ensures compliance with applicable laws and regulations and full consideration of environmental impacts. Unfortunately, in the case of the DEIS for the Hay Creek II LBA, the purpose and need appears flawed in several regards.

a. The Purpose and Need is not Stated

The "Purpose and Need" section in the DEIS at pages 1-15—1-16 appears to fail to state the underlying purpose and need to which the BLM is responding in proposing the alternatives in the DEIS. The section is one page long simply does not identify the actual purpose and need to which the BLM is responding with the alternatives proposed in the DEIS.

b. The BLM Appears to Have Inappropriately Limited the Scope of its Decisionmaking Authority

A

Notwithstanding the lack of a clearly defined "Purpose and Need" section, it appears the BLM may believe the purpose and need is to "[respond] to the continued demand for coal in the U.S., primarily for the purpose of generating electricity." DEIS at 1-15. If this is the case, then the "Purpose and Need" is wholly inappropriate and illegally constrains the agency's decisionmaking authority.

Indeed, under BLM's coal leasing regulations dealing with LBAs, the agency first and foremost has a nondiscretionary duty to ensure that any LBA "is consistent with the applicable regulations," would not "compromise the regional leasing process defined in [43 CFR § 3420.3]," and, above all, "would not be contrary to the public interest" on the basis of environmental or other sufficient reasons. *See* 43 CFR §§ 3425.1-8(a)(1)—(3). Nowhere in the purpose and need are these overriding duties addressed. This raises serious concerns that the BLM has constrained its ability to reject the proposed LBA in accordance with 43 CFR § 3425.1-8, or at least failed to retain the ability to develop alternatives in order to fulfill the agency's legal obligations.

We do understand that there is a general need to generate electric power for the public. However, there are a number of ways to generate electric power for the public, including through renewable energy development, through natural gas, through greater efficiencies, and through conservation of energy. By narrowing its focus on coal, the BLM has limited its ability to consider these other energy alternatives. Furthermore, by narrowing its focus on coal, the BLM

10

has constrained its ability to adequately analyze and assess more cost-effective alternatives for generating electricity. As will be explained further in these comments, the cost of the CO_2 associated with burning the coal proposed to be leased through the Hay Creek II LBA could be as much as $4,826,080,000. **That's more than $4 billion.**[5] These potential costs indicate that if energy affordability is going to be a component of the BLM's purpose and need, the agency cannot limit itself solely to considering coal as a source of electricity.

Overall, if the BLM is going to develop a purpose and need that revolves around providing electricity to the public, the agency cannot limit its consideration only to coal. Not does such a narrow purpose and need prevent the BLM from fulfilling its legal obligations under 43 CFR § 3425, but it constrains the ability of the agency to develop a range of reasonable alternatives. Particularly in the context of the impacts of the environmental impacts of the proposed Hay Creek II LBA—including global warming, air quality, and other impacts—the agency must broaden the scope of its purpose and need and DEIS to ensure a range of alternatives is rigorously explored. As it stands, the only action alternatives proposed so far involve mining coal, a clear indication that the purpose and need is far too narrow.

A

2. The DEIS Fails to Adequately Analyze and Assess the Global Warming Impacts of the Hay Creek II LBA in Accordance with NEPA

We are concerned that the BLM has not adequately analyzed or assessed all direct, indirect, and cumulative greenhouse gas emissions ("GHG") emissions, nor analyzed and assessed the global warming impacts associated with these emissions.

a. The DEIS Does not Quantify the Indirect CO_2 Emissions Associated with the Hay Creek II LBA

To begin with, nowhere in the DEIS does the BLM quantify the amount of indirect GHGs expected to be released as a result of burning the coal offered for sale through the Hay Creek II LBA. The DEIS states that the Buckskin Mine currently is responsible for 0.74 percent of all U.S. CO_2 emissions in 2006 and that these emissions would be extended for 14 years under the No Action Alternative, but there is no disclosure as to the actual CO_2 emissions associated with the action alternatives. This is a major oversight. Based on emission factors stated by the BLM in the DEIS, it appears that the Hay Creek II LBA could lease to the release of more than 273 million tons of CO_2. This represents more than 4% of all the CO_2 released in the United States in 2008.[6] The BLM must accurately quantify indirect CO2 emissions from the Hay Creek II LBA to ensure an adequate analysis and assessment of climate impacts.

B

[5] This dollar figure is based on the current spot price of carbon as established by the European Union (in U.S. dollars). As of May 11, 2010, the trading price of CO_2 in the European Union was 15.10 euros per metric ton, equivalent to US $19.41 per metric ton. *See* EUROPEAN CLIMATE EXCHANGE, http://www.ecx.eu/ (last visited May 11, 2010).

[6] According to the EPA, 2008 CO_2 emissions in the U.S. amounted to 5,921.2 million metric tons. *See* Excerpts of EPA, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS (April 2010), Executive Summary and Chapter 3 *attached as* **Exhibit 5**.

10

b. The DEIS Fails to Assess the Significance of the Direct, Indirect, and Cumulative GHG Emissions Associated with the Hay Creek II LBA

GHG emissions from burning the coal authorized by the Hay Creek II LBA are a reasonably foreseeable consequence of this federal action, as the BLM has recognized. We appreciate the discussion of climate change in the EIS and the BLM's effort to disclose certain GHG emissions. However, the analysis is incomplete under NEPA and CEQ regulations because the BLM failed to assess the significance of the direct, indirect, and cumulative GHG emissions associated with the Hay Creek II LBA.

The DEIS does disclose the projected direct GHG emissions associated with the Hay Creek II LBA, and provides some indication as to the indirect and cumulative emissions. The DEIS also briefly discloses that global warming caused by human-released GHG emissions is contributing to a number of negative consequences, particularly in the American West. *See* DEIS at 4-106—4-111. Unfortunately, the DEIS ends there. While the DEIS discloses the GHG emissions associated with burning the coal proposed to be leased through the Hay Creek II LBA, the DEIS entirely fails to assess the significance of these emissions, or make any effort to analyze how such emissions are likely to contribute to the negative consequences of global warming. CEQ regulations clearly require that an EIS discuss "[d]irect effects and their significance," "[i]ndirect effects and their significance," as well as analyze and assess cumulative impacts. 40 CFR §§ 1502.16(a), (b) and (d).

In this case, it appears as if the GHG emissions associated with the Hay Creek II LBA will be more than significant. The proposal will make available up to 149.7 million tons of recoverable coal. Over the life of the leases, the coal, once burned, will emit more than 273 million tons of carbon dioxide.

Not only that, but the GHG emissions associated with the Hay Creek II LBA also appear significant in terms of the cumulative impacts of other pending coal leases in the Powder River Basin. Consider this:

- Already, CO_2 emissions make up more than 85% of the U.S.'s total greenhouse gas emissions;[7]
- Coal-fired power plants release more than 33% of total CO_2 emissions, more than any other source in the nation;[8]
- The Powder River Basin produces 42% of all coal burned in coal-fired power plants in the United States, more than any other region of the country (*see* DEIS at 4-111);
- When burned, coal from the Powder River Basin produce 13.9% of all CO_2 emissions in the United States, more than any other region of the country (*id.*); and

B

[7] ***See* Exhibit 5.**

[8] *Id.*

10

- The Hay Creek II LBA, in proposing to mine upwards of 149.7 million tons of coal from the Powder River Basin, would release more than 273 million tons of carbon dioxide, further contributing to the Powder River Basin's role as the largest source of all coal-fired power plant CO_2 emissions in the U.S.

To sum it all up, the Hay Creek II LBA would continue to mine large amounts of coal in the largest coal production region of the U.S., leading to the release of a significant amount of CO_2 in a region that is already responsible for the largest amount of coal-fired power plant CO_2 emissions, which are the largest source of carbon dioxide emissions in the U.S., within which CO_2 comprises the vast majority of all GHGs released.

In accordance with NEPA, the BLM must assess the significance of the direct, indirect, and cumulative GHG emissions associated with the Hay Creek II LBA and fully discuss climate change impacts to a degree commensurate with the significant impact of this coal lease.

c. The DEIS Fails to Quantify the Cost of GHG Emissions

The NEPA requires that the BLM "identify and develop methods and procedures . . . which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decisionmaking along with economic and technical considerations." 42 USC § 4332(2)(B). The DEIS does not quantify the environmental effects of climate change, and in particular the cost of GHG emissions.

B

The Ninth Circuit held that it was arbitrary and capricious for a federal agency to not include a cost or benefit of carbon emissions in a NEPA document for car gas mileage standards. *Center for Biological Diversity v. Nat'l Highway Traffic Safety Admin.*, 538 F.3d 1172, 1203 (9th Cir. 2008). The Court ordered the agency to include a monetized value of carbon emissions in the NEPA document, reasoning in part that "the value of carbon emissions reduction is certainly not zero." *Id.* at 1200, 1203. Here, the BLM has made the same error: it has omitted any monetization of the costs of carbon emissions that will result from the burning of coal to be mined under the Hay Creek II LBA. This omission is even worse here than the omission in *National Highway Traffic Safety Administration*, because the burning of the Hay Creek II LBA's coal will result in more than 273 million tons of CO_2, or more than 4% of the nation's total greenhouse gas inventory. Therefore, the BLM must monetize carbon emissions associated with the Hay Creek II LBA and include those numbers in any EIS.

In *National Highway Traffic Safety Administration*, the court listed a number of possible values in dollars per ton of CO_2 emissions that are mitigated (i.e., not emitted). The dollar amounts ranged from a low of $3 per ton to a high of $50 per ton CO_2. *See* 538 F.3d at 1199. As of May 11, 2010, the trading price of CO_2 in the European Union was 15.10 euros per metric ton, equivalent to US $19.41 per metric ton.[9] The BLM could easily use these per ton prices as a starting point for calculating the present-day cost of CO_2 emissions that it will cause by leasing the Hay Creek II LBA. Using the above European Union carbon market price, the emissions from burnt coal have a present value of $4,826,080,000.

[9] *Supra*. Note 5.

10

d. The DEIS Fails to Adequately Analyze and Assess Global Warming Impacts

Also of concern is that the DEIS fails to analyze and assess how the direct, indirect, and cumulative GHG emissions will influence global warming. As the BLM indicates in the DEIS, it can be assumed that the release of GHGs associated with the Hay Creek II LBA will contribute to global warming. Yet the BLM makes no attempt to analyze and assess such impacts and the magnitude of contribution to global warming.

The failure to analyze and assess global warming impacts is particularly of concern in light of explicit direction from Secretarial Order No. 3226. Secretarial Order 3226, which was amended in January of 2009, requires that the BLM, "Consider and analyze potential climate change impacts when undertaking long-range planning exercises, setting priorities for scientific research and investigations, and/or *when making major decisions affecting DOI resources.*" Secretarial Order No. 3226A1, Sec. 4(a) (Jan. 16, 2009). Clearly the decision to lease up to 149.7 million tons of coal is a major decision affecting Department of Interior resources. Thus, the BLM has a duty to "[c]onsider and analyze potential climate change impacts."

Unfortunately, the BLM did not do so. Instead, the BLM asserts that "Tools necessary to quantify incremental climatic changes associated with those factors for the projected development activities in the PRB [Powder River Basin] are presently unavailable. Consequently, impact assessments of effects of specific anthropogenic activities cannot be performed." DEIS at 4-107. We are skeptical of this assertion. Indeed, the BLM neither references nor discloses any support for this assertion and does not appear to have made any attempt to ascertain whether there were, in fact, tools to assess climate change impacts associated with the Hay Creek II LBA.

B

At the least, one would presume that, in light of the fact that climate change is posing adverse environmental impacts, that any contribution of additional human-created greenhouse gas impacts, regardless of how significant, would exacerbate, or at least buttress, these adverse impacts. In light of this, the significance threshold would simply be whether the proposed action would lead to an increase in GHGs, or at least extent the length of time that GHGs will be created, thereby fueling climate change.

However, even if the BLM is correct in its assertion that tools are "unavailable," the DEIS fails to comply with NEPA. The CEQ regulations require that an agency "evaluate reasonably foreseeable significant environmental effects on the human environment," even where information relevant to making this evaluation is "incomplete or unavailable." 40 CFR § 1502.22. If this is the case, the agency must clearly show that the information is "lacking" by providing what credible scientific information it does have on these reasonably foreseeable impacts and making an effort to analyze these impacts based on this information. *Id.* What information the agency must provide depends upon the costs of obtaining the information. *Id.*

For example, the agency must include "information relevant to reasonably foreseeable adverse impacts" even if it is "incomplete," if it is "essential to a reasoned choice among alternatives and the overall costs of obtaining it aren't exorbitant." 40 CFR § 1502.22(a). Even

10

where the costs are exorbitant, or the means of obtaining the information are unknown, the agency must still provide information on reasonably foreseeable adverse impacts. This information includes:

> (1) A statement that such information is incomplete or unavailable; (2) a statement of the relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment; (3) a summary of existing credible scientific evidence which is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment, and (4) the agency's evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community.

40 CFR § 1502.22(b). Under this section, reasonably foreseeable "includes impacts which have catastrophic consequences, even if their probability of occurrence is low, provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason." *Id.*

Despite the BLM's claim that tools are unavailable to analyze and assess the global warming impacts associated with the Hay Creek II LBA, nowhere in the DEIS is it apparent that the requirements of 40 CFR § 1502.22 have been met. This is particularly troublesome given the apparent significance of the direct, indirect, and cumulative GHG emissions associated with the Hay Creek II LBA, as well as the BLM's general disclosure regarding the catastrophic impacts of global warming. As it stands, the DEIS fails to comply with NEPA with regards to the analysis and assessment of the global warming impacts of the Hay Creek II LBA.

B

e. The DEIS Fails to Adequately Analyze and Assess the Cumulative Impacts of Department of Interior-authorized Activities

The DEIS fails to analyze and assess the cumulative impacts of other actions undertaken by the Department of Interior on global warming. We are especially concerned that the Department of Interior is not programmatically analyzing its GHG emissions and global warming impacts of its operations and activities. Because the BLM is an agency within the Department of Interior, it is imperative that the DEIS fully analyze and assess the cumulative impacts of other Interior Department activities.

In fact, there are a number of projects that release GHGs and cumulatively contribute to global warming, that are under control by the Department of Interior, and that therefore must be addressed pursuant to NEPA *See e.g.*, 40 CFR § 1502.16 (an EIS "will include the environmental impacts of the alternatives including the proposed action"); 40 CFR § 1508.8 (effects include "ecological (such as the effects on natural resources and on the components of, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative"); and 40 CFR § 1508.7 (cumulative effects are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency

C

10

(Federal or non-Federal) or person undertakes such other actions"). The projects authorized or proposed to be authorized by the Department of Interior and its agencies include:[10]

- Numerous other coal leases proposed in the Rocky Mountain West, including the Dakota Westmoreland coal lease modification proposed in March of 2009 by the BLM in North Dakota;[11]
- The Greens Hollow coal lease proposed in 2008 by the BLM in the Price Field Office of Utah;[12]
- The Peabody Twentymile Coal Company Application for Coal Lease approved in 2008 by the BLM in the Little Snake Field Office of Colorado;[13]
- The Absaloka Mine South Extension Coal Lease approved in 2008 by the Bureau of Indian Affairs on the Crow Indian Reservation in Montana;[14]
- The Red Cliff coal mine proposed in 2009 for authorization by the BLM in the Grand Junction Field Office of western Colorado;[15]
- Tar sands and oil shale development proposed in 2008 by the BLM for Colorado, Utah, and Wyoming.[16]
- The Toquop coal-fired power plant in Nevada, which is proposed to be authorized by the BLM;[17] and
- The Desert Rock coal-fired power plant in New Mexico, which is proposed to be authorized by the Bureau of Indian Affairs.[18]

C

The BLM must consider the impacts of its proposal to authorize the Hay Creek II LBA cumulatively with other Department of Interior authorized activities that also contribute to global warming. Until such time as BLM analyzes the cumulative impacts of greenhouse gas emissions from other Department of Interior authorized activities, BLM cannot move forward with the Hay Creek II LBA in compliance with NEPA.

---

[10] Due to the large size of the following documents, we are unable to submit the following documents as electronic attachments.

[11] *See* Environmental Assessment available at http://www.blm.gov/pgdata/etc/medialib/blm/mt/field_offices/north_dakota.Par.96662.File.dat/DWCea.pdf (last visited May 11, 2010).

[12] *See* EIS available at http://www.blm.gov/pgdata/etc/medialib/blm/ut/price_fo/Coal.Par.48515.File.dat/Greens%20Hollow%20DEIS.pdf (last visited May 11, 2010).

[13] *See* Environmental Assessment available at http://www.blm.gov/pgdata/etc/medialib/blm/co/information/nepa/little_snake_field/2008_documents.Par.4735.File.dat/CO-100-2008-058EA.pdf (last visited May 11, 2010).

[14] *See* Record of Decision available at www.deq.state.mt.us/eis/Absaloka/ROD.pdf (last visited May 11, 2010).

[15] *See* DEIS available at http://www.blm.gov/co/st/en/BLM_Programs/land_use_planning/rmp/red_cliff_mine/documents.html (last visited May 11, 2010).

[16] *See* EIS available at http://ostseis.anl.gov/eis/guide/index.cfm (last visited May 11, 2010).

[17] *See* DEIS available at http://www.blm.gov/nv/st/en/fo/ely_field_office/blm_programs/energy/toquop_energy/toquop_draft_eis.html.

[18] *See* DEIS available at http://www.desertrockenergyeis.com/ (last visited May 11, 2010).

10

f. The DEIS Fails to Consider Reasonable Alternatives to Address the Global Warming Impacts of the Hay Creek II LBA

The range of alternatives "is the heart of the environmental impact statement." 40 CFR § 1502.14. It is well understood that "NEPA requires that an agency 'rigorously explore and objectively evaluate all reasonable alternatives.'" *Utahns for Better Transp. v. Dept. of Transp.*, 305 F.3d 1152,1168 (10th Cir. 2002) *quoting* 40 C.F.R. § 1502.14(a), *modified on rehearing Utahns for Better Transp. v. Dept. of Transp.*, 319 F.3d 1207 (2003). The alternatives discussed should provide different choices from which decisionmakers and the public can make an informed choice after considering the environmental effects of the alternatives. *See Westlands Water Dist. v. U.S. Dep't of Interior*, 376 F.3d 853 (9th Cir. 2004). The range of alternatives should also "include reasonable alternatives not within the jurisdiction of the lead agency," and "include appropriate mitigation measures not already included in the proposed action or alternatives." 40 CFR § 1502.14. The alternatives discussed in the DEIS do not meet these requirements in the context of addressing GHG emissions and global warming impacts.

The DEIS must consider a wider range of reasonable alternatives. The proposed action is practically identical to Alternative 2. Because of this similarity, the EIS effectively considers only one alternative other than the proposed action, hardly a "range" under NEPA. What's more, the alternatives are assumed to have practically identical environmental effects on global warming.

We strongly urge the BLM to rigorously explore and objectively evaluate the following alternatives in order to ensure to sharply define the issues and ensure a well-informed decision that mitigates significant environmental impacts:

B

- **The range of alternatives should include tonnage and acreage limits to leases so that changes can be made in the future to respond to GHG emissions regulation.** The DEIS discusses the relevance of potential GHG regulation under new legislation that may be enacted later this year. DEIS 4-116. Given the likelihood that some form of carbon regulation will be put in place before the coal from Hay Creek II LBA is mined, it would be prudent for the BLM to include upper limits in the lease agreements. These limits will create flexibility for the BLM in the future to change or modify leases in response to shifts in national energy policy towards lower-carbon, renewable sources. While BLM cannot predict what legislation will be enacted, flexibility would leave the door open for unpredictable changes without compromising current coal production. Rather than writing-in tonnage or acreage limits to the leases, the same alternative could be achieved by presenting an alternative that contains a coal quantity *less than* the quantity in the Proposed Action. This alternative is especially reasonable in light of the fact that the DEIS discloses that all three mines seeking leases have a remaining life of more than 10 years.

- **The range of alternatives should include the establishment of a renewable energy fund to spur solar and wind development in Wyoming to mitigate carbon emissions and to create long-term jobs.** To mitigate climate change impacts without

10

compromising the national power supply, a renewable energy fund should be established based on a per-ton tax on coal from the Hay Creek II LBA. This fund should be used to spur development of wind and solar resources in the Powder River Basin and in Wyoming. It is a fact that Wyoming contains significant wind resources; significant solar potential exists, as well.[19] These resources have not been adequately developed, especially solar. Federal funding for wind and solar could help to diversify the local economies and create jobs that last indefinitely, because sun and wind will last forever. In contrast, coal mining jobs will disappear as soon as the coal runs out.

- **The range of alternatives should include a requirement that the coal lessees purchase carbon offsets.** Carbon offsets are stocks or shares that represent a certain amount of CO_2 emissions that have been prevented or mitigated. The mining companies are not currently paying the price for externalities caused by CO_2 emissions from burning coal. A 2008 report estimated those externalities cost society $515 billion per year.[20] These externalities include all of the effects of climate change, as well as regional air and water pollution, and mining accidents. Mine companies can start to begin paying for the full cost of using coal for power generation by purchasing offsets to mitigate some of the damage that is being caused by emissions from coal.

- **The range of alternatives should include a requirement that all carbon emissions from the Hay Creek II LBA used for electricity generation be captured and sequestered geologically.** The vast majority of the coal to be mined as a result of the Hay Creek II LBA will be burned for power generation and carbon emissions will be released into the atmosphere. To mitigate this very significant amount of emissions, the range of alternatives should include a plan to require carbon capture and sequestration ("CCS") of emissions equivalent to the amount produced by burning the Hay Creek II LBA's coal. CCS could be required as a contract condition for all coal sold from the Buckskin mine. In the alternative, the BLM could set a per-ton tax on the coal and use the revenue to develop and implement a CCS project that captures an equivalent amount of carbon emissions as would be generated by burning the Hay Creek II LBA's coal. BLM could site the CCS facility on BLM land, thus keeping the project within BLM jurisdiction. Even if the CCS project falls partially outside BLM jurisdiction, that fact does not excuse the BLM from considering in detail as an alternative. *See* 40 CFR § 1502.14.

B

- **The range of alternatives should include a Renewable Energy Standard ("RES") for coal mine operators.** To reduce direct emissions from operations, the leases should include an RES that requires operators to rely on a certain percentage of renewable energy to power vehicles, machinery, and buildings. Many states will require that as

[19] *Supra*. Note 4.

[20] GREENPEACE INTERNATIONAL, THE TRUE COST OF COAL (2008), http://www.greenpeace.org/raw/content/international/press/reports/true-cost-coal.pdf (last visited May 11, 2010). The report presents the cost as 360 billion euros. Converted to dollars as of May 11, 2010, that cost is $462.73 billion.

much as 25 percent of all electricity is generated by renewable sources by 2025.[21] Taking some of this renewable power and using it to power the mines is a realistic and reasonable way to mitigate emissions without placing a large burden on the coal extraction industry. According to the DEIS, GHG emissions associated with electricity use at the mine could be as high as 69,007 tons of CO2e. *See* DEIS at 3-207. If renewable energy was used, these GHG emissions could be significantly mitigated. Additionally, employing renewable energy would improve local air quality.

10

B

- **The range of alternatives should include a requirement that all mine vehicles be run on alternative fuels.** Alternative fuels include hydrogen, biodiesel, natural gas, and electricity. Similar to the RES alternative above, an alternative fuels requirement for vehicles would reduce direct GHG emissions associated with mining activities, and simultaneously improve local air quality.

3. The DEIS Fails to Adequately Analyze and Assess PM Impacts

The DEIS fails to adequately analyze and assess the particulate matter impacts of the Hay Creek II LBA. In particular, the DEIS fails to provide information and analysis demonstrating that PM_{10} mitigation measures will effectively limit concentrations to ensure compliance with the NAAQS.

a. It is Unclear how Background PM-10 Was Established and how it was Factored into the BLM's Analysis

The DEIS asserts that background 24-hour PM_{10} concentrations are 54 micrograms/cubic meter in the Powder River Basin. *See* DEIS, Table F-1 at F-4. This background is apparently based on 2002 data gathered from the Eagle Butte Mine in Campbell County, WY.

It is unclear how this background level of PM_{10} was assessed. For one thing, it is unclear why the BLM utilized 2002 data when more recent monitoring data exists. For another thing, it is unclear why the BLM utilized data from the Eagle Butte Mine and not one of the mines in the vicinity of the Hay Creek II LBA area. Finally, it is unclear how the BLM assessed background concentrations. Under federal regulations, the PM_{10} NAAQS are attained whenever the number of days in a calendar year with a 24-hour concentration of 150 micrograms/cubic meter exceeds one. It is unclear how the assessed background 24-hour PM_{10} concentration in the context of the NAAQS.

D

Adding to this confusion, it is unclear how the BLM factored background PM_{10} concentrations into the agency's analysis of PM-10 impacts. While background levels are noted, it does not appear that the DEIS actually assessed any potential PM_{10} increases in order to assess whether PM-10 NAAQS will be fully protected.

---

[21] *See* PEW CENTER ON GLOBAL CLIMATE CHANGE, RENEWABLE AND ALTERNATIVE ENERGY STANDARDS, http://www.pewclimate.org/what_s_being_done/in_the_states/rps.cfm (last visited May 11, 2010).

10

We strongly urge the BLM to assess PM-10 impacts based on monitoring data from all sites within the vicinity of the Hay Creek II LBA. We request the BLM assess PM-10 impacts at each individual monitoring site to ensure compliance with the NAAQS across the area.

b. The DEIS Fails to Provide Information and Analysis Supporting the Effectiveness of any PM_{10} BACT Measures

D

Also of concern is that the DEIS does not provide information or analysis demonstrating that best available control technology requirements, or BACT, for PM_{10} will be effective at protecting the NAAQS. Our concerns are particularly salient in light of the fact that the BLM discloses that on a cumulative basis, the 24-hour PM_{10} NAAQS are likely to be exceeded as a result of the Hay Creek II LBA. *See* DEIS at 4-41. The BLM must provide an analysis and assessment of mitigation measures to support any assertion that the 24-hour PM_{10} NAAQS will be protected as result of the logical consequence of mining the Hay Creek II LBA.

4. The DEIS Fails to Adequately Analyze and Assess Ozone Impacts

The DEIS fails to adequately analyze and assess ozone impacts to ensure compliance with the NAAQS.

a. The BLM is Inappropriately Assessing Impacts to the Ambient Air Quality Standards

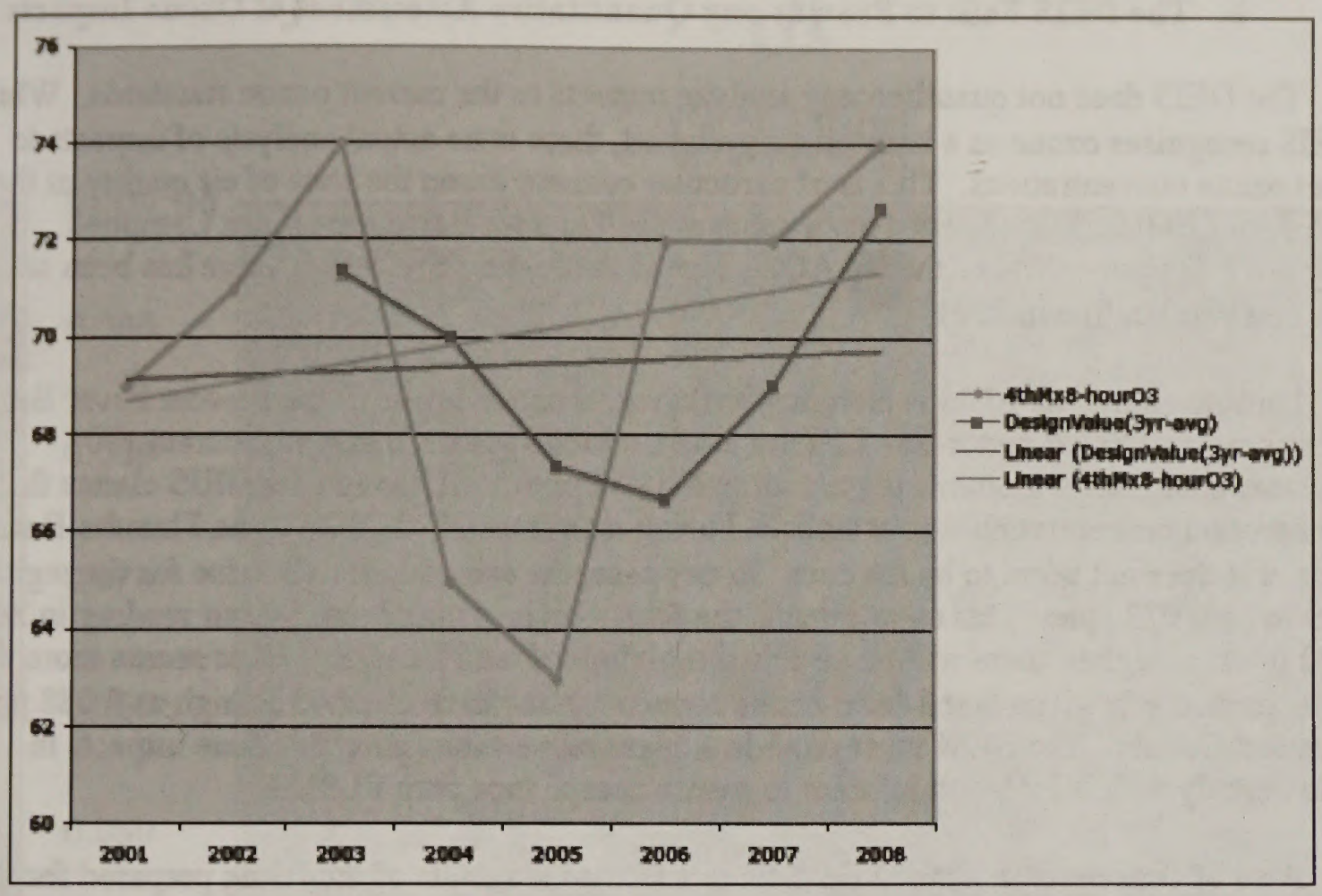
E

The BLM mistakenly asserting that the new ozone NAAQS of 0.075 ppm is not applied retroactively. *See* DEIS at 3-61—3-62. In other words, the agency is asserting that prior to May 2008, when the new ozone NAAQS was promulgated, impacts and compliance are assessed in the context of the old ozone NAAQS of 0.080 ppm. As a result, BLM does not seem to be addressing exceedances of the current NAAQS that occurred prior to 2008 in the context of analyzing and assessing impacts, and that bear on the status of air quality in the region.

To begin with, this is not only contrary to how the NAAQS are applied, but troublesome in light of what monitoring data is showing in the Powder River Basin. Since 2001, ozone levels have exceeded the 0.075 ppm standard on 16 days in Campbell County.[22] Not only that, but the three-year average of the 4th highest annual 8-hour readings, or the design value, at both Campbell County ozone monitors is trending upward. Although the Campbell County ozone monitors obviously have not been operating for very long, a trend seems to be emerging. Notwithstanding this, the BLM asserts that "no exceedances" of the current ozone NAAQS have occurred in the Powder River Basin. *See* DEIS at 3-62. This is flat out wrong.

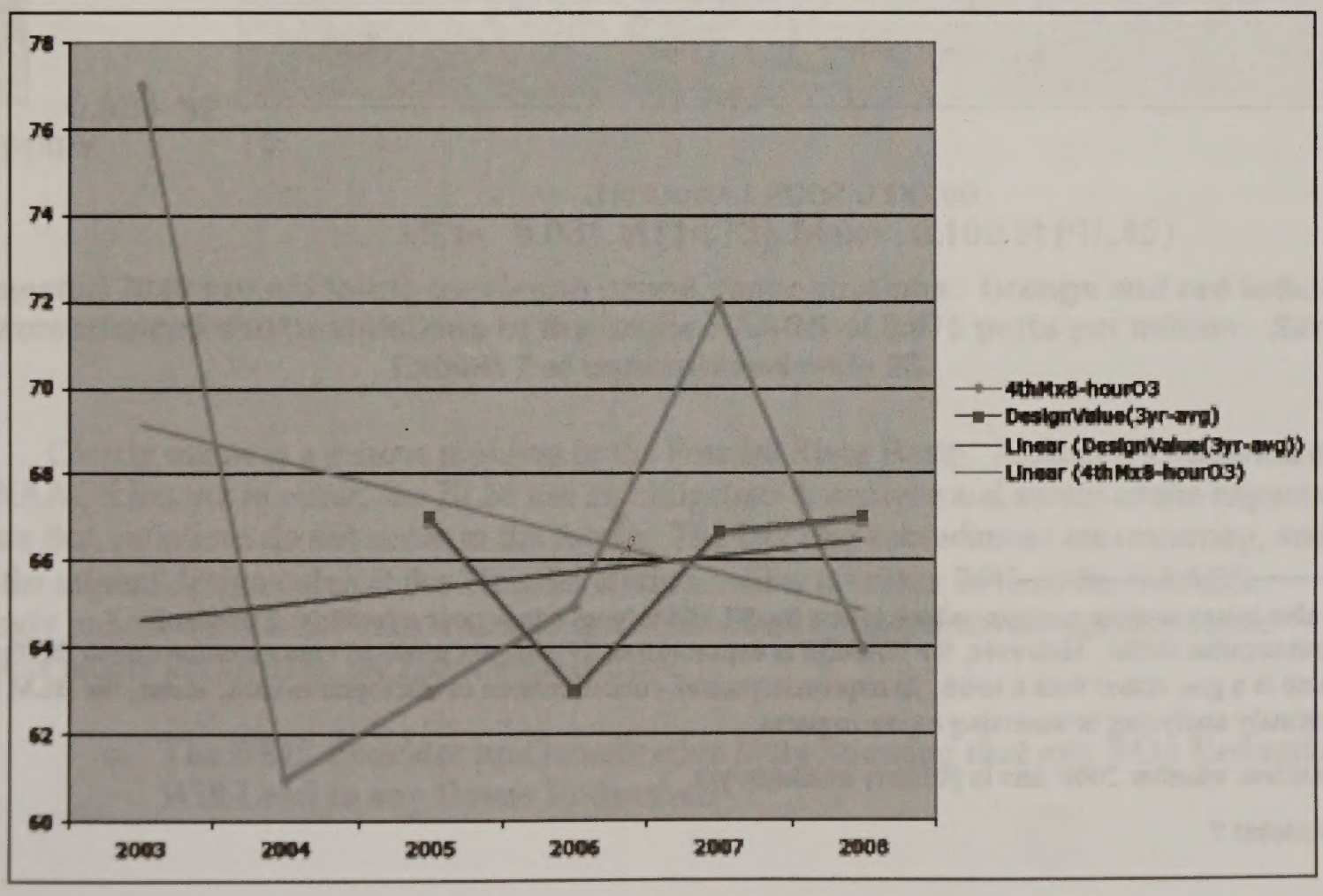
[22] *See* **Exhibit 6**. Contrary to BLM's assertion, an exceedance of the ozone NAAQS occurs anytime 8-hour concentrations exceed 0.075 parts per million. This is why the EPA monitoring data identifies 16 ozone exceedances at the Campbell County ozone monitors since 2001.

10



4th Maximum 8-hour Ozone Readings and Ozone Design Values (three year average of 4th max.) from Thunder Basin Ozone Monitor (above) and S. Campbell County Ozone Monitor (below) (data from EPA).

E



10

b. The DEIS Fails to Provide any Quantitative Assessment of Ozone Impacts

The DEIS does not quantitatively analyze impacts to the current ozone standards. While the DEIS recognizes ozone as a harmful air pollutant, there is no actual analysis of impacts to ambient ozone concentrations. This is of particular concern given the state of air quality in the Powder River Basin. The current design value at the Thunder Basin monitor in Campbell County is 0.072 ppm—96% of the NAAQS. This is the highest the design value has been since the monitor went online in 2001.

Unfortunately, the BLM is claiming background ozone levels in the Powder River Basin are 70 micrograms/cubic meter (*see* DEIS at 3-43), which appears highly inaccurate. 70 micrograms/cubic meter amounts to only around 0.030 ppm.[23] Although the DEIS claims that the background concentration was established using data from 2002-2008 at the Thunder Basin monitor, this does not seem to be the case. In any case, the accurate design value for the region appears to be 0.072 ppm. This means that if the fourth highest maximum 8-hour reading in 2009 is 0.082 ppm or higher, there will be an actual violation of the NAAQS.[24] This seems more than possible, particularly given that 8-hour ozone concentrations have climbed as high as 0.088 ppm in Campbell County. The BLM must provide a quantitative assessment of ozone impacts in order to comply with NEPA and in order to ensure compliance with FLPMA.

Also of concern is that the DEIS fails to address the results of modeling prepared for the Western Regional Air Partnership, which strongly indicate that attainment and maintenance of the 8-hour ozone NAAQS is at risk throughout the Western States, including in the Powder River Basin of Wyoming.[25] This modeling in fact shows that the annual fourth maximum 8-hour ozone concentration will exceed 0.075 ppm throughout much of Wyoming. *See* Figure below.

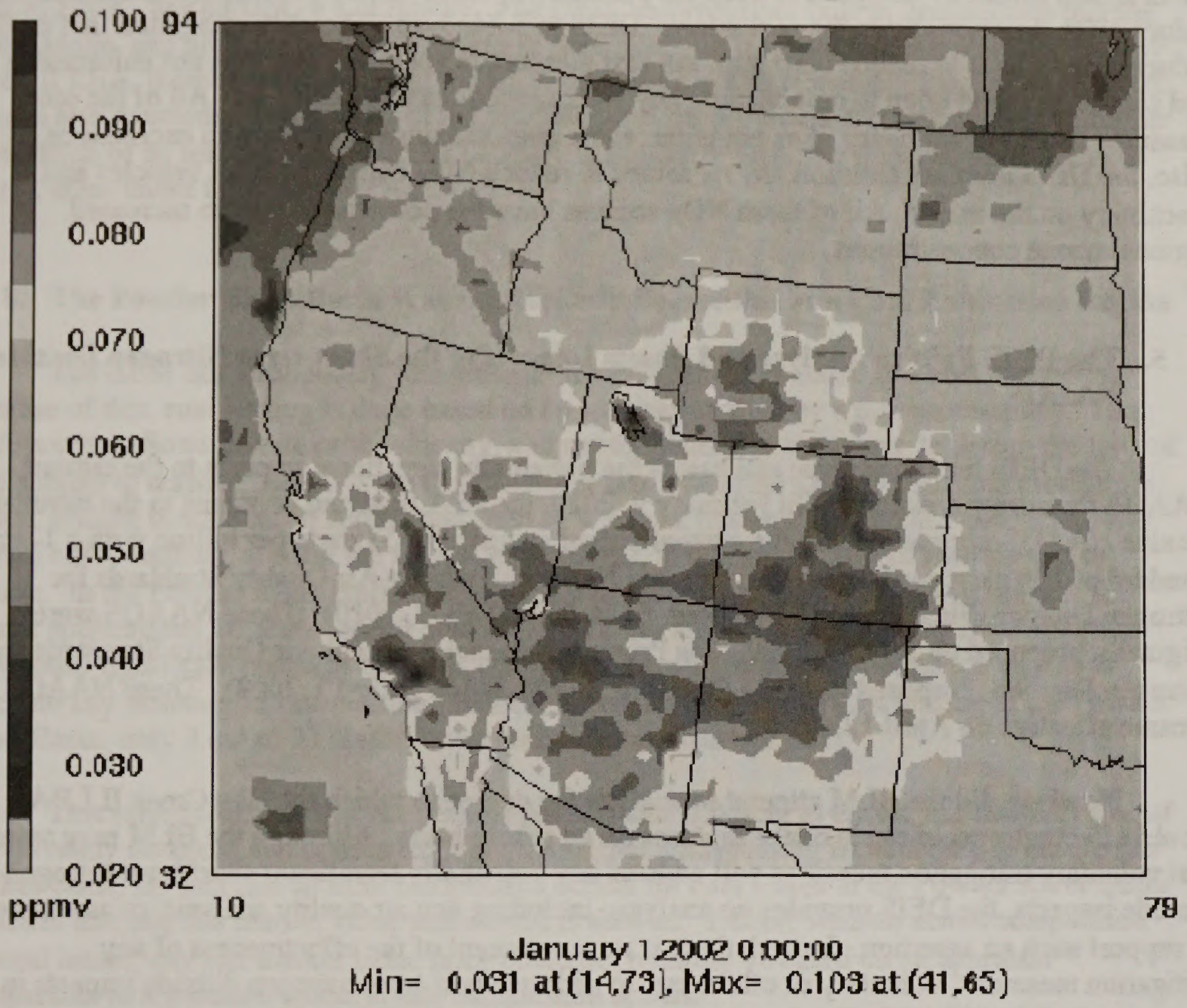
E

[23] This also raises another concern, which is that the BLM analyzes ozone concentrations in terms of micrograms/cubic meter. However, the NAAQS is expressed as a "parts per million" concentration due to the fact that ozone is a gas, rather than a solid. In expressing ozone concentrations in micrograms/cubic meter, the BLM is not accurately analyzing or assessing ozone impacts.

[24] It is unclear whether 2009 data is publicly available yet.

[25] *See* **Exhibit 7**.

10



Projected 2018 annual fourth maximum ozone concentrations. Orange and red indicate exceedances and/or violations of the ozone NAAQS of 0.075 parts per million. See Exhibit 7 at unnumbered slide 28.

Clearly ozone is a serious problem in the Powder River Basin. Although a violation of the NAAQS has yet to occur, the BLM has an obligation to analyze and assess ozone impacts to ensure that violations do not occur in the future. The fact that exceedances are occurring, and that the current design value at the Thunder Basin monitor is within 96% of the NAAQS, strongly indicates the BLM cannot simply ignore the need to quantitatively analyze ozone impacts before authorizing the Hay Creek II LBA.

E

c. The DEIS Provides no Quantitative Data Showing that any NOx Reductions Will Lead to any Ozone Reductions

10

The DEIS asserts that measures to reduce mine-related NOx emissions "should also" reduce the potential for the formation of ground level O3 in the PRB." DEIS at 3-75. There is no quantitative support for this statement. What's more, even on a qualitative level, this statement is misleading and in accurate. The direct NO_X mitigation measures in Section 3.4.3.3 are designed primarily designed to keep the public away from clouds of NO_2, not as a means to reduce NOx emissions from the coal mines. DEIS at 3-74, 3-75. The only mitigation that might reduce emissions is to reduce blast size, but that measure is voluntary and thus not enforceable and cannot be relied upon to demonstrate any NOx reductions will occur. *Id.* All of the other measures listed are voluntary, thus not enforceable even if a mine is causing an exceedance. Also, the DEIS does not mention any measures to reduce NO_X emissions from vehicles and machinery on the mines. All of these NO_X sources have the potential to lead to increased regional ozone concentrations.

5. The DEIS Fails to Analyze and Assess Impacts to the Short-term Nitrogen Dioxide NAAQS

The DEIS fails to analyze and assess the potentially significant impacts to the current NAAQS for nitrogen dioxide. On February 9, 2010, the EPA finalized revisions to the nitrogen dioxide NAAQS, supplementing the current annual standard of 53 parts per billion with a 1-hour standard of 100 parts per billion. *See* Primary National Ambient Air Quality Standards for Nitrogen Dioxide, Final Rule, 75 Fed. Reg. 6474-6537 (Feb. 9, 2010). These NAAQS were originally proposed on July 15, 2009. *See* Primary National Ambient Air Quality Standards for Nitrogen Dioxide, Proposed Rule, 74 Fed. Reg. 34404-34466 (July 15, 2009). These NAAQS became effective on April 12, 2010.

E

Nowhere did the BLM attempt to analyze the degree to which the Hay Creek II LBA would affect nitrogen dioxide concentrations on an hourly basis. Although the BLM may assert that voluntary mitigation measures will address any potentially significant short-term nitrogen dioxide impacts, the DEIS provides no analysis, including any air quality analysis, or assessment to support such an assertion. Indeed, there is no assessment of the effectiveness of any mitigation measures, voluntary or otherwise, to address short-term nitrogen dioxide impacts in the context of the NAAQS. Furthermore, to the extent that the BLM relies on voluntary measures to address any potentially significant nitrogen dioxide impacts, such measures cannot serve to mitigate impacts given that they are unenforceable.

6. Visibility Impacts are not Assessed

The DEIS indicates that visibility will be further degraded in a number of Class I areas and sensitive Class II areas as a result of the Hay Creek II LBA. *See* DEIS at 4-44. Unfortunately, there is no assessment of the significance of these impacts. In light of the BLM's duties to safeguard air quality, it appears that these impacts are significant and should be mitigated accordingly in accordance with NEPA.

F

10

7. The BLM Fails to Demonstrate Compliance with FLPMA With Regards to Air Quality Impacts

As explained, the BLM has a duty to ensure compliance with the NAAQS in accordance with FLPMA. *See* 43 USC § 1712(c)(8). The DEIS unfortunately fails to demonstrate that the PM_{10}, ozone, and nitrogen dioxide NAAQS in particular will be protected as a result of the Hay Creek II LBA, thereby indicating that the BLM may not meet its responsibilities under FLPMA. We are also concerned that in light of the visibility impacts projected, the agency may be further in violation of its responsibilities under FLPMA to minimize visibility impacts, particularly to Class I areas under the Clean Air Act.

E

8. The Powder River Basin Was Erroneously Decertified as a Coal Production Region

The BLM has erroneously "decertified" the Powder River Basin as a coal production Because of this, coal leasing is done based on an application filed by a private company. The LBA process allows private coal company, and not the federal government, to design the tract of land subject to leasing. Because the Powder River Basin remains a decertified coal production region, leasing is done on an application filed by a private company. The LBA process allows private coal company, and not the federal government, to design the tract of land subject to leasing. In the Powder River Basin this has allowed each major coal producer in the area to submit applications for lease federal coal leases in areas and on tracts that they have designed. This raises significant concerns that coal companies are designing tracts in such a way as to preclude any meaningful competition. Indeed, in the last 20 years of coal leasing in the Powder River Basin, only 3 out of 21 leases have received more than one bid.

This raises concerns that the Federal government is failing to ensure fair market value of any privately designed and nominated lease tracts. Notwithstanding BLM's duty to ensure fair market value, the fact that so little competition occurs for coal leases in the Powder River Basin indicates that any fair market value assessment is skewed. Indeed, with no actual competition for coal leases, any fair market value price could not possibly be based on an appraisal comparable to a situation where actual competition occurs.

G

What's more, the "decertification" and the LBA process has allowed the BLM to avoid establishing regional leasing levels based on a regional analysis of environmental impacts and public comment. As will be explained further, the "decertification" is preventing the BLM from fully analyzing, assessing, and addressing the regional environmental impacts of coal leasing in the Powder River Basin. For the reasons explained below, the BLM cannot move forward with the Hay Creek II LBA in light of the decertification.

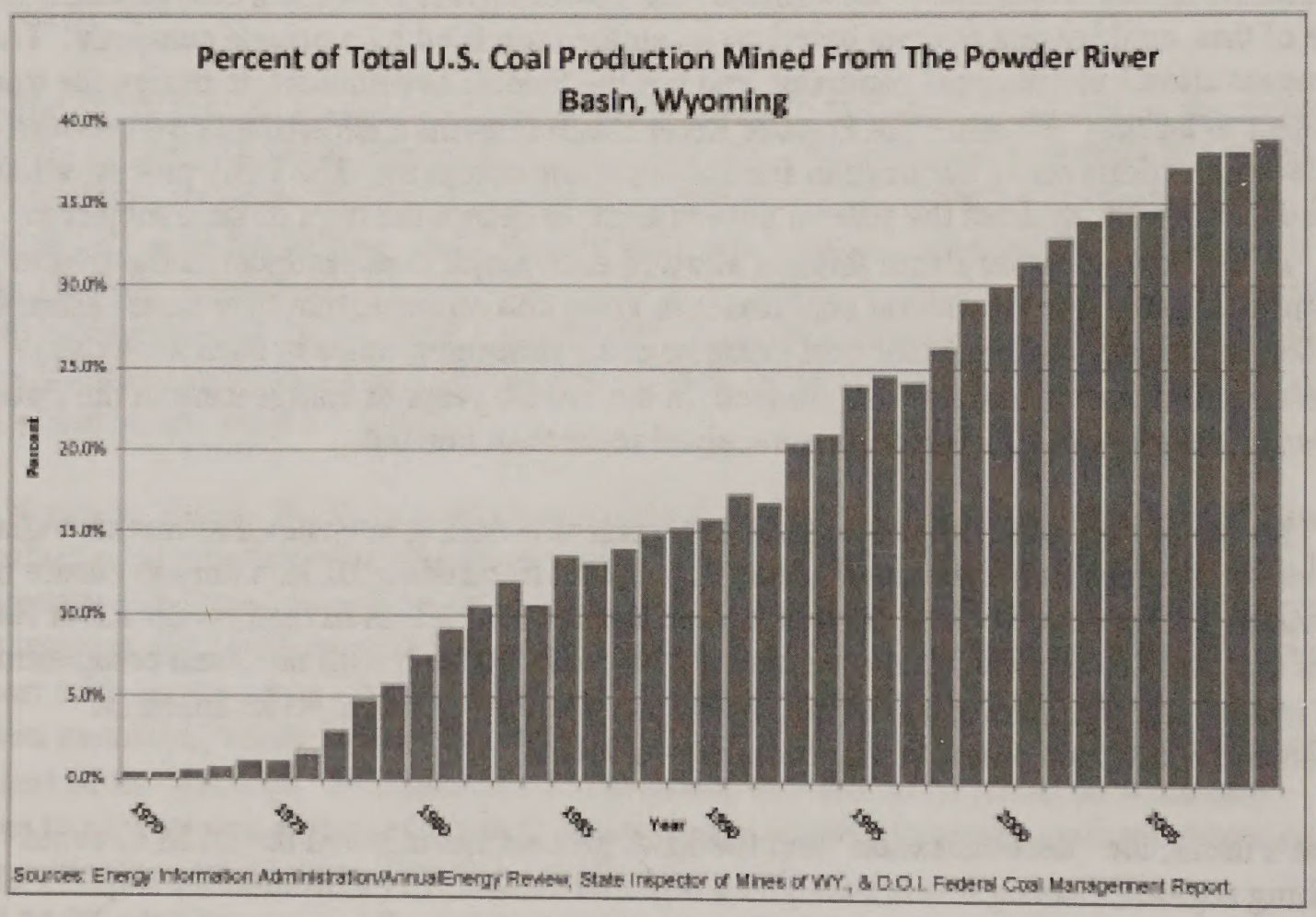
a. The Decertification was Arbitrary and Capricious and Contrary to BLM's Coal Leasing Regulations

The Powder River Basin was "decertified" as a Federal coal production region coal production region in January of 1990. In other words, the BLM has asserted that the Powder River Basin is outside a coal production region in accordance with 43 CFR § 3400.5. This

10

"decertification" was made on the recommendation of the Powder River Regional Coal Team in October of 1989. This decertification was arbitrary and capricious, and contrary to BLM coal leasing regulations. As applied in the context of the Hay Creek II LBA it is blatantly illegal.

Although there is no definition of "coal production region" in BLM's regulations, the common sense meaning of the word is that it refers to a region where coal is produced. This is exactly why the Powder River Basin was originally designated a "coal production region" in accordance with 43 CFR § 3400.5. Such a designation made sense, even in 1989. Indeed, even in 1989, the Powder River Basin produced nearly 15% of all coal produced in the United States. *See* chart below.[26] This hardly seems indicative of a region that was not producing coal, or that otherwise had no interest from the coal industry.



The BLM has responded that decertification was needed to spur interest in coal leasing in the Powder River Basin. This is not supported by the record of that decision. In response to a March 2009 Freedom of Information Act request submitted to both the Montana and Wyoming BLM offices by WildEarth Guardians seeking all records supporting the 1989 decision by the

[26] This chart is available at www.blm.gov/pgdata/etc/medialib/blm/wy/programs/energy/coal/prb.Par.5321.Image.-1.-1.1.gif (last visited May 11, 2010).

Regional Coal Team to decertify the Powder River Basin, we received no records indicating that coal leasing interest had been waning, that decertification would actually lead to increased leasing interest, or any other information suggesting that the Powder River Basin was not a coal production region. What seems apparent is that the Powder River Regional Coal Team appeared to move to "decertify" the Powder River Coal Production Region so as to be able to utilize the LBA process. This is clearly an arbitrary and capricious reason to "decertify" the Powder River Basin as a coal production region.

10

Furthermore, although BLM may have discretion to "change" a coal production region or alter boundaries, the regulations are clear that coal production regions are to be used to identify, rank, analyze, select, and schedule lease tracts (i.e., activity planning) in accordance with 43 CFR § 3420.3-1. Logically, the only time the BLM would be allowed to "decertify" a coal production region is if activity planning was inappropriate, such as in areas that were determined to be unacceptable for further consideration for leasing through any land use planning prepared consistent with 43 CFR § 3420.1-4.

Did the BLM make a determination that the entire Powder River Basin was unacceptable for further consideration for leasing through any land use planning prepared consistent with 43 CFR § 3420.1-4? The answer appears to be no.

b. Even if the Decertification was Appropriate in 1989, it is Now Inappropriate in Light of Current Production and Leasing Levels in the Powder River Basin

G

Although it is seriously questionable whether the "decertification" of the Powder River Basin as a coal production region was appropriate in 1990, it is clear that it is inappropriate today. Indeed, coal production in the Powder River Basin region is significant and has increased substantially over the years. According to data from the BLM's own website, coal production just in the Wyoming portion of the Powder River Basin has increased from 293 million tons to more than 419 tons in 2009. The region is currently producing more coal than anywhere else in the country.

Furthermore, the Powder River Basin region produces more coal than any other region in the United States. Currently, the Powder River Basin provides 42% of the nation's coal, a figure that has grown substantially over the years. According to the Energy Information Administration, the Powder River Basin currently produces more coal than all the coal mines combined east of the Mississippi River. Indeed, in 2008, the entire Powder River Basin produced more than 495,000 tons of coal while mines east of the Mississippi produced 491,935.[27] This is a significant amount of coal to be produced from a single region.

Additionally, leasing interest has been very high in the Powder River Basin. Since 1990, 21 coal leases have been offered amounting to more than 5.8 billion tons of coal. Not only that,

[27] *See* http://www.eia.doe.gov/cneaf/coal/page/acr/table1.html (last visited May 11, 2010).

but the BLM has 12 coal leases pending—including the Hay Creek II LBA—that collectively have the potential to lead to the leasing of an additional 5.8 billion tons of coal.[28]

What's more, in light of the fact that "decertification" has apparently spurred additional leasing interest in the Powder River Basin (as evidenced by the Hay Creek II LBAs), why hasn't the BLM taken steps to "recertify" the Powder River Basin. If "decertification" is warranted in light of low interest in leasing, then certainly "recertification" clearly is warranted in light of the current high interest in leasing. Clearly the Powder River Basin is a coal production region and must be recertified as such in light of current leasing and production levels.

c. The Decertification Means the BLM has Failed to Appropriately Assess Environmental Impacts and Appropriately Involve the Public in Regional Leasing

Although the decertification of the Powder River Basin as a coal production region raises well-founded concerns that the BLM is unable to ensure fair market value through the LBA process, we are most concerned with the fact that the decertification has prevented the BLM from appropriately analyzing and assessing the environmental impacts of leasing, from setting appropriate leasing, or activity, levels, and from appropriately involving the public in regional coal leasing decision.

Indeed, BLM's coal leasing regulations prescribe a number of requirements and procedures that are normally followed when leasing occurs in a "coal production region." For instance, 43 CFR § 4320.2 requires, among other things, that regional leasing levels be established, that a regional leasing environmental impact statement be prepared, and that the Secretary of the Interior take into account the environmental effects when setting regional leasing levels. Further, activity planning at 43 CFR § 3420.3-1 requires that alternative leasing levels be analyzed in the regional leasing EIS, and that the tract ranking process at 43 CFR § 3420.3-4(a)(1) also requires consideration of environmental effects when the regional coal team sets tract rankings. The regulation states, "Three major categories of consideration shall be used in tract ranking: coal economics; impacts on the natural environment; and socioeconomic impacts." If the Powder River Basin was a coal production region, the BLM would be required to prepare a regional lease sale EIS "on all tract combinations selected by the regional coal team for the various leasing levels" and consider "[t]he site-specific potential environmental impacts of each tract being considered for lease sale" and "[t]he intraregional cumulative environmental impacts of the proposed leasing action and alternatives, and other coal and noncoal development activities." 43 CFR § 3420.3-4(c).

In other words, if the Powder River Basin was a coal production region, the BLM would not only be required to set regional leasing levels based on consideration of environmental impacts, but would prepare a much more comprehensive EIS addressing

[28] Based on the high development scenario alternatives for the Hay Creek II, South Gillette, West Antelope II, and Wright Area LBAs.

10

the impacts of all lease tracts, both individually and cumulatively, before moving to lease coal in the Powder River Basin.

Not only would environmental impacts be appropriately considered, but the public would have numerous opportunities to submit input not only on regional coal leasing levels, but on the regional leasing EIS as well. *See* 43 CFR §§ 3420.2 and 3420.3-4. The regulations give the public an opportunity to consider the environmental effects of regional leasing levels and of tract selections for leasing. By "decertifying" the Powder River Basin as a coal production region, the BLM has shut the door on the ability of the public to influence regional leasing levels and the selection of regional tracts for leasing. Currently, the public is simply forced to respond to LBAs proffered by coal companies.

The inability of the BLM to fully address the environmental impacts of regional coal leasing in the Powder River Basin and to fully involve the public in accordance with the competitive leasing requirements of 43 CFR § 4320, is especially problematic in light of the global warming impacts of coal leasing in the Powder River Basin. Put simply, the BLM has failed to establish regional leasing levels accordingly based on consideration of global warming impacts and failed to address the regional global warming impacts of coal leasing in the Powder River Basin. The agency has also denied the public the ability to influence regional leasing levels based on their concerns over global warming.

d. The DEIS Cannot Serve as Functional Equivalent to a Regional Leasing EIS, Which Would Otherwise be Required

G

Although the BLM may claim that the Hay Creek II DEIS fulfills the agency's duties to consider regional leasing impacts and involve the public, this is not the case. Particularly in the context of global warming and GHG emissions, there is no possible way that the DEIS could serve as a functional equivalent.

While the DEIS presents some regional data regarding CO_2 emissions for the Powder River basin region, the public does not have an opportunity to comment on these regional impacts because the DEIS only deals with the question of leasing the Hay Creek II LBA. Thus, this DEIS cannot be a "functional equivalent" of a regional EIS because the action considered, as well as the alternatives considered, are limited in size and scope to the Hay Creek II LBA.

Moreover, the BLM emphasizes the limited scope of this NEPA analysis by asserting that the No Action Alternative would not result in fewer CO_2 emissions because other coal mines would supply just as much coal to the national market. Although this claim is spurious, to say the least, under a regional leasing level EIS, this would certainly not be true because the Powder River Basin is the United States' largest sources of coal. A decision not to lease any coal in the Basin would undoubtedly significantly impact the nation's coal supply and national CO_2 emissions. Under a regional EIS, the public would be able to comment on a No Action Alternative or various other action alternatives that could better address the need to reduce national CO_2 emissions in order to mitigate the impacts of global warming. Here, in contrast, the public may only submit comments on Alternatives that the BLM asserts will not impact climate change anyway. Thus, the LBA process does not provide the public with an opportunity to

consider and comment upon the significant environmental effects caused by the tremendous amount of CO_2 emissions release by coal from the Powder River Basin region.

Regardless, the BLM cannot claim that the Hay Creek II DEIS fulfills the requirements of a regional leasing EIS, yet fail to adhere to other procedures under 40 CFR § 3420 regarding the establishment of regional leasing levels and activity planning, among other requirements.

e. The Powder River Regional Coal Team is Illegally Operating

We finally want to raise the concern that the Powder River Regional Coal Team appears to be operating illegally. Under BLM regulation, Regional Coal Teams are established only for coal production regions. *See* 43 CFR § 3400.4(a). Because the Powder River Basin has been "decertified" as a coal production region, the Regional Coal Team is not legally allowed to exist or function in any of the capacities set forth under BLM's coal leasing regulations at 43 CFR §§ 3400 and 3420.

10

G

9. Even if the Decertification of the Powder River Basin Remains Appropriate, the BLM Must Still Assess Whether the Hay Creek II LBA Would be Contrary to the Public Interest

Under the LBA regulations, the BLM must reject any application that, on the basis of environmental or other sufficient reasons, would be contrary to the public interest. *See* 43 CFR § 3425.1-8. In this case, even if the BLM determines that the "decertification" of the Powder River Basin was appropriate, the agency must still provide a full and thorough assessment as to whether the Hay Creek II LBA is contrary to the public interest.

In this case, given the global warming impacts of the Hay Creek II LBA, it appears apparent that it would be contrary to the public interest to approve the LBAs. It is undisputed that anthropogenically generated carbon dioxide and other greenhouse gases present a substantial endangerment to the health of persons and the environment and that denial of the Hay Creek II LBA is necessary to protect the long-term health of the public, the environment, and the economy. As already discussed, and as the BLM has already disclosed, coal from the Hay Creek II LBA will be burned, generating massive amounts of carbon dioxide, fueling global warming.

Climate change is the most-serious threat to public health and the environment facing the world today. The evidence is that climate change, including dangerous increases in temperature, primarily attributable to human emissions of carbon dioxide and other greenhouse gasses is occurring now, and has already caused harm to the health of persons and the environment. Unless effective measures to address climate change and its consequences are implemented in the immediate future, harm to human health and the environment of unprecedented severity and scope, including additional loss of human life and collapse of entire ecosystems may result.

WildEarth Guardians has submitted numerous pieces of scientific information and comments disclosing and discussing the effects of global warming and the need for the BLM to urgently address the problem. The BLM has similarly disclosed in the DEIS scientific

B

information and analysis documenting the contribution of coal mining in the Powder River Basin and subsequent coal burning to greenhouse gas emissions and global warming. In light of the clear link between anthropogenic greenhouse gas emissions and global warming, as well as the massive impact Powder River Basin coal has on overall greenhouse gas emissions within the United States, the BLM has clear reason to reject the Hay Creek II LBA pursuant to 43 CFR § 3425.1-8.

10
B

Thank you for the opportunity to comment.

Sincerely,

Jeremy Nichols
Climate and Energy Program Director
WildEarth Guardians
1536 Wynkoop, Suite 301
Denver, CO 80202
(303) 573-4898 x 1303
jnichols@wildearthguardians.org

10

WILDEARTH GUARDIANS
A FORCE FOR NATURE

May 12, 2010

Wyoming High Plains District Office
Bureau of Land Management
Attn: Teresa Johnson
2987 Prospector Drive
Casper, WY 82604

Re: Hay Creek II Coal Lease Draft EIS Comments

Dear Ms. Johnson:

In submitting our May 11, 2010 comments on the Hay Creek II Coal Lease by Application ("LBA") Draft Environmental Impact Statement ("DEIS"), we inadvertently left the Sierra Club off as a cosignatory and a party to those comments. Thus, for your records, the Sierra Club hereby joins WildEarth Guardians' as a party to the May 11, 2010 comments on the Hay Creek II LBA and DEIS. Their contact information is below. Thank you.

Sincerely,

Jeremy Nichols
Climate and Energy Program Director
WildEarth Guardians
1536 Wynkoop, Suite 301
Denver, CO 80202
(303) 573-4898 x 1303
jnichols@wildearthguardians.org

and

Aaron Isherwood
Senior Staff Attorney
Sierra Club Environmental Law Program
85 Second Street, 2d Floor
San Francisco, CA 94105-3441
(415) 977-5680
aaron.isherwood@sierraclub.org

BLM RESPONSES TO COMMENT LETTER 10

10

A) Purpose and Need

Please review Section 1.2; the BLM has stated the purpose and need of the EIS and the proposed action. The purpose of this EIS is to analyze and disclose the potential effects to the natural and human environment from the proposed leasing of a maintenance tract of federal coal in the Wyoming Powder River Basin (PRB). A mining operator made application to lease a tract of federal coal in order to have sufficient coal reserves to continue to operate an already existing mine (FEIS at 1.1.1). Although leasing this tract would not authorize mining operations on those lands, the EIS evaluates the potential impacts of mining the tract because mining is a logical consequence of issuing a lease for a maintenance tract of federal coal (FEIS at 1.1.2). The EIS presents the Bureau of Land Management's (BLM's) analysis of environmental impacts under the authority of the National environmental Policy Act (NEPA) and associated rules and guidelines.

Sections 1.3 and 1.4 of the EIS – immediately following the section on purpose and need – describe the regulatory framework and responsibilities for federal coal development, as well as enumerating BLM's relevant guidelines and regulations. These include compliance with the 43CFR 3400 regulations cited in the comment.

The final EIS explains the extent of BLM's decision-making authority to lease coal on federal lands and our mission under our various mineral leasing laws which is to encourage the development of domestic coal reserves and reduction of US dependence on foreign sources of energy.

The EIS is not intended to be an environmental analysis of the numerous technologies that are capable of producing electricity. The FEIS has been revised to include additional information regarding the projected electric generation portfolio of the United States. Studies have indicated that even with a considerably more optimistic projection for renewable sources, coal use continues to be projected as the largest portion of the domestic electric fuel mix until at least 2035.

BLM does have wide discretion in determining the extent and identification of lands to consider offering in response to a coal lease application. The FEIS addresses a full range of alternatives to the lease by application (LBA) submitted by the applicant. The range includes an alternative which represents all lands that contain coal reserves that are comparable to those applied for and which may be efficiently recovered with the LBA, an alternative which contains lands that may enhance competitive interest in the tract, and an alternative which contains lands that could be bypassed if not leased. On the other end of the range is the No Action Alternative.

B) Global warming and GHG

Global warming, GHGs, and climate change were thoroughly discussed in chapters 3 and 4. In chapter 3, specifically section 3.3.2.1, there is a discussion of methane and CBNG. The EIS estimated direct emission of GHG because of continuing operations at the Buckskin mine in section 3.18.3 and table 3.18-2. The potential GHG volumes resulting from the assumed use of this coal at dispersed electric generation facilities was also discussed. Further, section 4.2.14.1 in chapter 4 of the EIS discusses GHGs and climate change in depth including the observed and projected effects of global warming, sea level changes, differential temperature changes, and changes to vegetation and habitat.

10

In chapter 4 (section 4.2.14.1 and section 4.2.14.2), we estimated the amount of GHG emissions that could be attributed to coal production from leasing the proposed LBAs, as well as from the forecast coal production from all coal mines in the Wyoming PRB. It was assumed that all PRB coal would be used for coal-fired electric power generation. This gives an upper estimate of GHG emissions resulting from use of the coal that would be produced from the proposed LBA and for forecast total PRB coal production. The estimate was derived by relating the portion of coal produced in the Wyoming PRB to national steam coal totals, and then applying that ratio to the total emission of GHG estimated in the U.S. from coal-fired electric generation.

The potential impacts of climate change represent the cumulative aggregation of all worldwide GHG emissions. The EIS provides a meaningful context and measure of the relative significance of coal use from the proposed LBAs and overall projected PRB coal production on total GHG emissions.

Additionally the EIS states that policies regulating specific levels of significance have not yet been established for GHG emissions. Given the state of the science, it is not possible to associate specific actions with the specific global impacts such as potential climate effects. Since there are no tools available to quantify incremental climate changes associated with these GHG emissions, the analysis cannot reach conclusions as to the extent or significance of the emissions on the global climate.

The EIS addresses the environmental effects of leasing federal coal and the potential mining of that coal. The EIS addresses the environmental effects of leasing and potentially mining federal coal. The document also discloses the indirect emissions presuming the coal will be burned at utility power plants. The EIS neither attempts to estimate the cost of GHG emissions from coal combustion at power plants nor does it assert that the cost of GHG is zero or any particular value, as there is no known threshold or context for this value. In a regulatory structure where GHG control costs factor into electric generation costs, coal users would likely weigh these costs into capital and operating decisions. Electric generation activity is directly influenced by consumer demand. If electricity cannot be supplied to meet demand, power prices rise until the demand falls. Measures to reduce GHG emissions from coal burning are applicable at the place where the coal is consumed because the coal consumer must comply with regulatory and price constraints and this will bear on fuel choices. Infrastructure, equipment availability, incentives, and cost also determine the potential for switching to non-carbon based electric generation. Mining the lease reserves and the continued operation of a Powder River Basin mine is not directly tied to any existing or proposed electric generation facility. Limiting one or even several points of fuel supply will not affect coal use because of the diverse group of national and international suppliers.

A number of broad alternatives such as mitigation funds, taxes, and specific conditions exist that could be applied to any coal mining operator. However, revenues from coal leases are dispersed in a fixed formula specified in the Mineral Leasing Act (MLA). The Department of the Interior (DOI) has no discretion in this dispersion. Specific lease conditions apply only to that lease and are not a workable mechanism to regulate mining operations. These proposals would be programmatic or legislative in nature, and while considered, are beyond the scope and authority of the coal leasing actions addressed in this EIS. Coal mining companies do not burn coal and so do not purchase carbon offsets for burning coal. Facilities that burn coal would be required to purchase carbon offsets if the state that those facilities are in, or the Environmental Protection Agency (EPA), requires such offsets to be purchased. In the US, such offsets are not required, although companies, individuals, and governments can purchase carbon offsets through voluntary programs. The Buckskin Mine voluntarily uses electric powered heavy equipment (such as haul trucks and shovels) whenever possible as part of their air quality mitigation

plans. All other vehicle standards are regulated by the Department of Transportation through which the EPA is taking measures to reduce greenhouse gas emissions from vehicles nationwide. Please see the following website for more information on vehicle emission standards: http://www.epa.gov/oms/climate/regulations.htm.

BLM has estimated GHG emissions tied to the projected use of PRB coal as a fuel for electric generation. These emission levels are significantly large, but not new and not due to the proposed leasing of the Hay Creek II LBA, or presently proposed leasing cumulatively. Our analysis recognizes that the addition of non-carbon fueled electric generation sources could reduce future GHG emissions. Further, the addition of alternate sources of electric generation would potentially help to conserve carbon-based fuels and provide a broader portfolio of electric sources. The EIS discloses that the rate of consumption of coal in general, and PRB coal specifically, is not driven by leasing actions but is driven by future electric demand, regulatory frameworks, and relative costs and efficiencies of electric generation.

Please review the BLM National Environmental Policy Act (NEPA) Handbook H-1790-1 online at http://www.blm.gov/wo/st/en/info/nepa.html. As described in the handbook, proposed federal projects that are externally generated actions, like coal lease applications filed by a proponent, include the formulation of a range of alternatives encompassing denial of the request (No Action), approval of the request as proposed by the proponent, and approval of the request with modifications as made by BLM to the proponent's proposal. As exemplified in H-1790-1, the Buckskin Mine Hay Creek II coal EIS range of alternatives carry out the intent and spirit of NEPA.

The EIS is not an environmental analysis of the numerous technologies that are capable of producing electricity. The document was prepared pursuant to the NEPA and other applicable regulations and statutes to address possible environmental and socioeconomic impacts that could result from the Hay Creek II coal lease application. The environmental effects and impacts associated with the wide variety of renewable electric generation technologies are well beyond the scope of this EIS.

C) Cumulative Impacts of DOI-authorized Activities

Regionally connected actions have been addressed in chapter 4. That chapter addresses current and planned development and describes cumulative development and environmental consequences of that development in the PRB. Both low and high production scenarios with projections to 2020 are discussed. Past, present, and reasonably foreseeable development and the cumulative environmental consequences of that development are also detailed. The years 2010, 2015, and 2020 were selected for the analysis of the direct, indirect, and cumulative impacts in chapter 4. This is the duration of the expected production as related to the LBA coal reserves.

This comment suggests that the EIS should examine a wide variety of actions with the only connection being that all the actions are under the jurisdiction of the DOI. The suggested approach in this comment does not recognize that each of these proposals are federal actions in their own right, and must be evaluated in light of the effects of that action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions.

The EIS addresses the environmental effects of leasing coal in the PRB and the logical result that the coal would potentially be mined by adjacent operating mines. The document goes on to disclose indirect emissions with the assumption that coal would be mined and burned to produce electricity. It is

beyond the scope of this EIS to analyze all the DOI-authorized projects and proposed activities that occur in the United States.

The BLM began a regional technical study in 2003. The Powder River Basin Coal Review is a dynamic, expanding body of information. Data is added continuously as it becomes available. The Review has been available to the public since 2006 and was the subject of an open house in May of that year to explain and demonstrate the modeling and report products. The Review is available online at: http://www.blm.gov/wy/st/en/programs/energy/Coal_Resources/PRB_Coal/ prbdocs.html.

The intent of the review was to evaluate the current condition of environmental and socioeconomic aspects in the PRB for a base year, to project reasonably foreseeable development for future years, and to develop models as well as other quantitative and qualitative tools to estimate future effects on environmental and socioeconomic aspects. The PRB coal review is not a NEPA document. It is a planning tool, a set of environmental impact analysis tools, and, when maintained through the years, is a method to calibrate development projections and related estimations of effects.

The coal review products were delivered and posted for public access in 2005, 2006, and 2009. Many of the initial reports have been updated. For example, the 2010 air quality modeling report has been supplemented by adding 2015 modeling and, most recently, 2020 modeling. BLM has also tracked annual development activity and has updated that work through 2008; the 2009 data will be added as it becomes available. With the 2009 completion of the groundwater model and the 2020 air quality modeling work, the reports have been issued and incorporated into the Hay Creek II FEIS cumulative analysis.

Modeling and report updates and revisions are posted to the website as they are completed and used as a tool for cumulative impact analysis and planning. BLM recognizes that the PRB coal review is not the only source for cumulative impact analysis which is why land use plans, WDEQ's Cumulative Hydrologic Impact Assessments, and other sources and tools are used in addition to the Coal Review.

D) Background PM_{10} (particulate matter measuring 10 micrometers or less in diameter) Impacts

The BLM neither permits, nor authorizes, mining operations and does not have the authority to regulate mining activities or mitigate air quality impacts. As discussed in detail in section 1.3 of the EIS, the WDEQ is authorized by the Secretary of the Interior to regulate surface coal mining operations and surface effects of mining on federal and non-federal lands within Wyoming.

It is stated in section 3.4.2.1 and section 3.4.2.3 of the EIS that the WDEQ/AQD requires the Wyoming PRB mines to collect air quality data. WDEQ/AQD has, by statute, the authority and responsibility to require mitigation for air quality impacts.

Air quality modeling for the Buckskin Mine is discussed in section 3.4.2 and appendix G. If the mine acquires the LBA tract, their current air quality permit will have to be amended to include the new lease before mining activities can proceed into the new lease area. New air quality modeling would need to be conducted in support of that permit application demonstrating on-going compliance with all applicable ambient standards.

The WDEQ conducts regularly scheduled mine inspections. The control measures identified as "best available control measure (BACM) that are employed at each of the mines are directed at transient problem areas or sites that are unique to the particular operation and are typically action measures rather than devices or installations. However, the actions employed by the mines during "natural events" can

10

be observed and noted during the agency's inspections. We describe Wyoming's natural events action policy (NEAP), including two lists of control measures designed to prevent exceedances during high wind events. Included in the lists are the measures that the mines can implement continuously so that they are in place before a high wind event occurs. These measures primarily address the principal mine-controlled sources of fugitive dust, which are large contiguous disturbed areas. The second list is an additional category of control measures that include actions that can be taken during a high wind event, depending on site-specific conditions. The implementation of best available control technology (BACT), BACM, and reactionary control measures assure that anthropogenic dust emissions from the coal mines in the PRB are controlled to the greatest extent possible. PM_{10} regulatory enforcement, monitoring and control is regulated by the WDEQ by agreement with EPA.

E) Ozone (O_3), Nitrogen Dioxide (NO_2), National Ambient Air Quality Standards (NAAQS), and Wyoming Ambient Air Quality Standards (WAAQS)

Section 3.4.3 contains the discussion of ozone, NO_2 and NAAQS in the general analysis area. Section 3.4.3.3 contains the discussion of the new 1-hour NO_2 and NAAQS.

Section 4.2.3 continues the discussion of NO_2, and appendix G at G-12 has additional discussion of NO_2. Section 3.4.3.1 addresses the analysis and impacts of short-term NO_2 NAAQS.

The BLM neither permits, nor authorizes, mining operations and does not have the authority to regulate mining activities or mitigate air quality impacts. As discussed in detail in section 1.3 of the EIS, the WDEQ is authorized by the Secretary of the Interior to regulate surface coal mining operations and surface effects of mining on federal and non-federal lands within Wyoming.

Ground-level ozone is not emitted directly into the air; it but is created by sources of nitrogen oxide (NO_x), which in the presence of volatile organic compounds (VOCs), reacts to form ground-level ozone. Therefore, the statement made in the EIS that measures to reduce mine-related NO_x emissions should also reduce the potential for the formation of ground-level O_3 in the PRB is entirely reasonable.

Section 3.4.3 (Emissions of Nitrogen Oxides and Ozone) has been updated and revised in the FEIS. The EIS discloses all sources for these gas emissions and the monitoring efforts of the WDEQ in the PRB.

The WDEQ does not currently require the PRB coal mines to ozone monitor or model ozone. Therefore, the applicant mines' current air quality permits do not address impacts to the ozone standards, and ozone monitoring data for the eastern PRB are limited. BLM has disclosed the sources of ozone emissions from the mining operations and the environmental consequences related to it.

However, ozone levels have been monitored by WDEQ/AQD at its ambient air quality monitoring sites in the PRB since 2001. An exceedance of the O_3 8-hour standard occurs if the fourth-highest daily maximum value is above the level of the standard. Table 3.4-4 shows that no exceedances of the O_3 standard have occurred at the monitoring site closest to the Buckskin Mine when evaluated under the standard in place at the time the values were recorded. The EIS discloses that BLM expects a stricter O_3 standard of between 0.06 and 0.07 parts per million (ppm) to be announced, and that such a standard could trigger non-attainment for ozone in the northern PRB.

The comment suggests that ozone levels in the PRB are trending upward. BLM cannot make that assertion based on the limited data that are currently available. Additional data from these two sites and preferably a larger ozone air quality monitoring network covering more of the basin are needed before any trends can be clearly defined. Based on data collected at WDEQ's Thunder Basin National

Grassland ozone monitoring site from 2005 through 2009, the background ozone level is estimated as 134 $\mu g/m^3$ (0.069 ppm). The Forest Service operates this monitor and reports to the EPA's national database (AQS), accessible through Air Explorer on the web at http://www.epa.gov/airexplorer/.

Note that on January 6, 2010, EPA proposed to strengthen the 8-hour "primary" standard NAAQS for ground-level ozone to a level within the range of 0.060-0.070 ppm. For the primary standard, ozone concentrations are averaged over 8-hour periods. The fourth highest 8-hour value at a particular monitor in the most recent year is averaged with the fourth-highest 8-hour values from the previous 2 years. This produces a 3-year average. To meet the standard, the 3-year average must be less than or equal to the level of the standard. In light of EPA's proposed ozone standard, additional ozone monitors would be needed in the PRB before a quantitative assessment of ozone impacts in the PRB could be made. Therefore, there is potential for this area to become designated non-attainment if a new lower standard is promulgated. Promulgation of a revised ozone standard has been delayed. The standard may now be issued sometime in 2011. If a new standard is issued, it would immediately become effective. Wyoming may adopt the new standard into its rules, but until it does, there would be two standards in effect (state and federal). Compliance will be determined in accordance with the more stringent standard.

An area could be deemed "non-attainment" for ozone after the new standard is issued, if air monitoring results in the area show that the three year average of the fourth-highest daily maximum 8-hour average exceeds the standard. This determination requires three years of monitoring data, documented exceedances of the standard, and the state designating a geographic area around the monitored area. EPA has to approve this geographic area, and the state would then prepare a state implementation plan (SIP) outlining how the area is to be brought back into compliance. The resulting SIP would outline regulatory measures that would pertain to all air quality permits in that area.

To date, the WDEQ air quality permitting process has not required Buckskin to perform short-term modeling of NO_2 impacts. Therefore, no model outputs are currently available to assess the mine's compliance with the 1-hour NAAQS standard for NO_2. It is anticipated that short-term modeling will be required at a future date, pending incorporation of the new 1-hour NO_2 standard in Wyoming's SIP and the Wyoming Air Quality Standards and Regulations (WAQSR).

Notwithstanding this deficiency, historical NO_2 concentrations are available on an hourly basis at two monitoring sites in the northern PRB. These data afford a surrogate measure of compliance with the 1-hour standard in the general area of the Buckskin Mine. Table 3.4-5 summarizes hourly NO_2 monitoring results for the Thunder Basin National Grassland (TBNG), and Belle Ayr Mine (BAM) sites. Based on the TBNG monitor, a background concentration of 11 parts per billion (ppb) can be compared to the NAAQS of 100 ppb, where both apply to the three-year average of the 98th percentile of the yearly distribution of 1-hour daily maximum NO_2 concentrations. The BAM monitor shows a comparable three-year average of nearly 35 ppb (after omitting incomplete data years), roughly three times the background value but one third of the NAAQS standard.

F) Visibility Impacts

Visibility impacts are discussed in section 3.4.4 as well as in section 3.4.2 (Particulate Emissions). In addition, table 3.0-2 has entries on visibility. In chapter 4, visibility is covered in section 4.2.3 (Air Quality) with table 4-14 and table 4.13 showing modeled change in visibility impacts at class I and sensitive class II areas. Please see these sections.

10

Visibility is defined as the distance one can see and the ability to perceive color, contrast, and detail. $PM_{2.5}$ (particulate matter measuring 2.5 micrometers or less in diameter) is the main cause of visibility impairment. Visual range, one of several ways to express visibility, is the farthest distance from which a person can see a landscape feature. Without the effects of human-caused air pollution, a natural visual range is estimated to be about 140 miles in the western part of the U.S. and 90 miles in the eastern part. Visibility impairment is expressed in terms of deciview (dv). The dv index was developed as a linear perceived visual change. It is the unit of measure EPA uses in the regional haze rule to achieve the national visibility goal. This goal was established as part of the Clean Air Act (CAA) to prevent any future, and remedy any existing, impairment of visibility in mandatory federal class I areas that result from human-caused air pollution. The dv index is a scale related to visual perception that has a value near zero for a pristine atmosphere.

Sections 3.4.2.1 and 3.4.3.1 discuss that $PM_{2.5}$ is a major cause of visibility impairment, with secondary impacts from NO_x emissions. Mitigation measures used to limit emissions of particulate matter are discussed in section 3.4.2.3, and NO_x mitigation measures are discussed in section 3.4.3.3. Additional information is provided in appendix G.

Section 169 of the CAA addresses visibility protection. On June 15, 2005, the EPA issued final amendments to its July 1999 regional haze rule. These amendments apply to the provisions of the regional haze rule that require emission controls known as best available retrofit technology, or BART, for industrial facilities emitting air pollutants that reduce visibility. The nearest class I PSD (prevention of significant deterioration) areas to the general analysis area for this LBA are Wind Cave National Park (about 100 miles east), and the Badlands wilderness area (about 150 miles east). There are also five class II PSD areas 80 to100 miles away from the LBA application general analysis area; all others are at least 100 miles away (table 3.4-8 of the FEIS). This EIS uses two tools to evaluate visibility impacts (regional modeling and visibility monitoring).

Regional modeling is used to estimate and disclose the change in the number of days that a change of 10% or more in extinction would occur by 2020, in relation to a baseline. Table 4-13 (FEIS) referenced in the comment portrays the results of this predictive modeling, estimating change to regional visibility over a 16 year period, based on all reasonably foreseeable projected regional activity. Additionally, on site monitoring at class I areas is included to show actual measured changes in visibility over the period of record (1989 to 2005). While monitoring results show annual variability in visibility impairment at two sites, the trend is stable overall with some slight lessening. PRB surface mines have not been subject to permitting under the PSD regulations because those mine emissions that are subject to PSD applicability levels fall below regulatory thresholds.

Visibility monitoring in Wyoming consists of both the WDEQ-sponsored Wyoming visibility monitoring network and the interagency monitoring of protected visual environments program (IMPROVE) program. The WDEQ has sited two visibility-monitoring stations in the PRB. The TBNG site is 32 miles north of Gillette and the Cloud Peak Wilderness Area site is 14 miles west of Buffalo (approximately 84 miles west of Gillette). Both sites include a variety of sophisticated monitoring equipment, as described in appendix G under "Existing Air Quality." These sites are used to characterize the extent, frequency of occurrence, and magnitude of impairments to visual air quality.

The Buckskin Mine ambient monitoring network consists of two low-volume Rupprecht & Patashnick Tapered Element Oscillating Microbalance (TEOM) PM_{10} particulate continuous monitors. The monitors were installed in late October 2000 to replace two high-volume TSP (total suspended

particulate) monitors located at the same sites. The continuous monitors collect uninterrupted, hourly average concentrations of particulate matter. The TEOM monitors meet the EPA Automated Equivalency Method (EQSA 0495-100).

Air pollution is controlled by state and federal air quality regulations and standards established under the federal CAA amendments administered by EPA. EPA established the NAAQS under the authority of the CAA. The WAAQS for the PM_{10} annual, the SO_x annual, and 24-hour levels are more stringent than the NAAQS and are enforced by WDEQ/AQD. State implementation plans are in place to ensure that proposed actions like coal mining comply with all associated air quality regulations and criteria.

G) Decertification

To be clear, the PRB Coal Production Region is a coal production region (PRBCPR). Leasing to maintain production at existing mines using the LBA process (43CFR3425) is the practice in the region. This has been the procedure since the region was decertified in 1990. Decertification recognized the region as a mature coal production region where the proper leasing mechanism was production maintenance leasing in response to identified needs of operating mines to replace reserves as available leased reserves were depleted. Decertification does not mean that the region is not a significant national coal producing region. Management of coal leasing in the PRBCPR by this method has been an issue first raised in comments on the South Gillette Area Coal DEIS, and the issue was presented to the PRB Regional Coal Team (RCT) at the team's meeting in November 2009. In November 2009, WildEarth Guardians petitioned the Secretary of Interior and the BLM Director to recertify the Powder River Basin Coal Production Region. In January 2011, BLM Director Robert Abbey denied the petition based on the following facts:

- All the mines in the PRB have been in place for decades;
- The LBA process provides coal reserves for leasing at a level approximately equal to the depletion by mining thereby assuring an optimum return to the public;
- The LBA process has effectively prevented speculation and bypass of Federal coal resources. The LBA process supports competition for Federal coal leases; and,
- The BLM has managed and continues to manage the LBA process consistent with the criteria and conditions that led to decertification of the PRBCPR in 1990.

The Powder River RCT meetings are open to the public and provide an opportunity for comment and statements. You are welcome to present, in person or in writing, to the team at any future meeting. The meetings are published in the Federal Register and a press release is posted on the BLM's web site.

The coal screening process was used to identify areas suitable for coal mining in the PRB. The Buffalo resource management plan update (2001), located on the BLM's Buffalo Field Office website at http://www.blm.gov/wy/st/en/programs/Planning/rmps.html contains a more detailed discussion in appendix E. The coal screening process consists of four steps: identify areas with coal development potential; apply the coal unsuitability criteria (20 criteria); assess multiple land use considerations; and, consult with surface owners concerning surface mining of federal coal under their private surface.

After step one of the coal screening process was applied, the BLM identified two areas with coal development potential: the Sheridan area was about 73,000 acres and contained 2.75 billion tons of mineable coal reserves. The Gillette area was around 494,000 acres with approximately 47.5 billion tons of mineable coal reserves. The results of step two (applying the 20 unsuitability criteria) are

covered in appendix B of this FEIS. Multiple land use considerations were assessed (step three), and it was determined that the existence of a coal lease will not prelude leasing other minerals for development with appropriate stipulations attached for simultaneous development. In the final step (surface owner consultation) 569 letters were sent with 317 responses received. About 20% of the private surface acre owners indicated an initial preference against mining.

You are correct that production of PRB coal has increased steadily since decertification. Part of this growth results from population increases, which in turn increases the demand for electric power and the related increase in demand for steam coal to fuel low-cost electric generation. There are also cost (mining and reclamation) advantages and sulfur compliance issues that have favored PRB coal over other domestic coal regions. The production increase has been made with no new mining operations opening since decertification; in fact, several of the operations have consolidated. As shown in figure 4-1 in the EIS, leasing under the LBA process has essentially occurred at the same rate as reserves existing prior to decertification were depleted. This level of leasing activity remains consistent with managing the coal production region under the decertification action.

Processing the Hay Creek II lease by application is consistent with the practice we follow in the decertified PRBCPR. These are production maintenance tracts, have been reviewed by the Powder River RCT, and are being reviewed under the LBA process in accordance with 43 CFR 3425.

Unsuitability for consideration for coal leasing is covered in appendix B. This determination is based on findings from the resource management plan (RMP) that encompasses the Buckskin Mine area. Appendix B in the EIS summarizes the findings of the RMP as well as a review completed as part of the EIS analyses to update and specify the acceptability for further consideration for coal leasing of lands within the general analysis area of the Buckskin Mine Hay Creek II EIS.

Like the regional leasing option under 43 CFR 3420, lease by application requires appropriate analysis and assessment of the environmental impacts of coal leasing. Lease by application also requires the opportunity for public participation. The NEPA process resulting in the Buckskin Mine Hay Creek II EIS achieves these requirements. Alternative regional leasing levels are not addressed in the LBA process because production maintenance leasing is the defined leasing level appropriate to a decertified coal production region. Coal leasing decisions under the lease by application process consider coal economics, both direct and cumulative impacts to the environment, and socioeconomic impacts.

The Buckskin Mine Hay Creek II EIS is not a regional EIS in the sense of the regulations at 43 CFR 3420. However, the EIS has been properly scoped to address direct, indirect, and cumulative impacts of the proposed leasing. BLM has chosen to address the currently pending LBAs in four separate EISs, some addressing groups of LBAs because of their geographical proximity, others as individual LBA EISs due to either no other LBAs in proximity or the fact that the EIS was already well underway prior to the nearby LBAs being filed. Each EIS is consistent in addressing the specific impacts of each LBA, in addressing the cumulative impacts of the specific LBA when added to other reasonably foreseeable activity, and in having complete public involvement at every step in the NEPA process.

The EIS is a disclosure document, not a decision document. The Record of Decision (ROD) is the decision document. Determination of public interest would be addressed in the ROD.

APPENDIX E

BUREAU OF LAND MANAGEMENT SPECIAL COAL LEASE STIPULATIONS AND FORM 3400-12 COAL LEASE

APPENDIX E: BUREAU OF LAND MANAGEMENT SPECIAL COAL LEASE STIPULATIONS AND FORM 3400-12 COAL LEASE

The BLM will attach the following special stipulations to any mine permit issued under the Proposed Action or Alternative 2.

In addition to observing the general obligations and standards of performance set out in the current regulations, the lessee shall comply with and be bound by the following special stipulations.

These stipulations are also imposed upon the lessee's agents and employees. The failure or refusal of any of these persons to comply with these stipulations shall be deemed a failure of the lessee to comply with the terms of the lease. The lessee shall require his agents, contractors, and subcontractors involved in activities concerning this lease to include these stipulations in the contracts between and among them. These stipulations may be revised or amended, in writing, by the mutual consent of the lessor and the lessee at any time to adjust to changed conditions or to correct an oversight.

(a) Cultural Resources

(1) Before undertaking any activities that may disturb the surface of the leased lands, the lessee shall conduct a cultural resource intensive field inventory in a manner specified by the Authorized Officer of the BLM or of the surface managing agency, if different, on portions of the mine plan area and adjacent areas, or exploration plan area, that may be adversely affected by lease-related activities and which were not previously inventoried at such a level of intensity.

The inventory shall be conducted by a qualified professional cultural resource specialist (i.e., archeologist, historian, historical architect, as appropriate), approved by the Authorized Officer of the surface managing agency (BLM, if the surface is privately owned), and a report of the inventory and recommendations for protecting any cultural resources identified shall be submitted to the Regional Director of the Western Region of the Office of Surface Mining (the Western Regional Director), the Authorized Officer of the BLM, if activities are associated with coal exploration outside an approved mining permit area (hereinafter called Authorized Officer), and the Authorized Officer of the surface managing agency, if different. The lessee shall undertake measures, in accordance with instructions from the Western Regional Director, or Authorized Officer, to protect cultural resources on the leased lands. The lessee shall not commence the surface disturbing activities until permission to proceed is given by the Western Regional Director or Authorized Officer.

(2) The lessee shall protect all cultural resource properties that have been determined eligible to the National Register of Historic Places within the lease area from lease-related activities until the cultural resource mitigation measures can be implemented as part of an approved mining and reclamation or exploration plan unless modified by mutual agreement in consultation with the State Historic Preservation Officer.

(3) The cost of conducting the inventory, preparing reports, and carrying out mitigation measures shall be borne by the lessee.

(4) If cultural resources are discovered during operations under this lease, the lessee shall immediately bring them to the attention of the Western Regional Director or Authorized Officer, or the Authorized Officer of the surface managing agency, if the Western Regional Director is not available. The lessee shall not disturb such resources except as may be subsequently authorized by the Western Regional Director or Authorized Officer.

Within two (2) working days of notification, the Western Regional Director or Authorized Officer will evaluate or have evaluated any cultural resources discovered and will determine if any action may be required to protect or preserve such discoveries. The cost of data recovery for cultural resources discovered during lease operations shall be borne by the lessee unless otherwise specified by the Authorized Officer of the BLM or of the surface managing agency, if different.

(5) All cultural resources shall remain under the jurisdiction of the United States until ownership is determined under applicable law.

(b) Paleontological Resources

If paleontological resources, either large and conspicuous and/or of significant scientific value, are discovered during mining operations, the find will be reported to the Authorized Officer immediately. Mining operations will be suspended within 250 feet of said find. The find will be stabilized and protected to minimize adverse impacts. An evaluation of the paleontological discovery will be made by a BLM-approved professional paleontologist within five (5) working days, weather permitting, to determine the appropriate action(s) to prevent the potential loss of any significant paleontological value. Operations within 250 feet of such discovery will not be resumed until written authorization to proceed is issued by the Authorized Officer. The lessee will bear the cost of any required paleontological appraisals, surface collection of fossils, or salvage of any large conspicuous fossils of significant scientific interest discovered during the operations.

(c) Threatened, Endangered, Candidate, or Other Special Status Plant and Animal Species

(1) The lease area may now or hereafter contain plants, animals, or their habitats determined to be threatened or endangered under the Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 et seq., or that have other special status. The Authorized Officer may recommend modifications to exploration and development proposals to further conservation and management objectives or to avoid activity that will contribute to a need to list such species or their habitat or to comply with any biological opinion issued by the Fish and Wildlife Service for the Proposed Action. The Authorized Officer will not approve any ground-disturbing activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the Endangered Species Act. The Authorized Officer may require modifications

to, or disapprove a proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species, or result in the destruction or adverse modification of designated or proposed critical habitat.

(2) The lessee shall comply with instructions from the Authorized Officer of the surface managing agency (BLM, if the surface is private) for ground disturbing activities associated with coal exploration on federal coal leases prior to approval of a mining and reclamation permit or outside an approved mining and reclamation permit area. The lessee shall comply with instructions from the Authorized Officer of the Office of Surface Mining Reclamation and Enforcement, or his designated representative, for all ground disturbing activities taking place within an approved mining and reclamation permit area or associated with such a permit.

(3) Any potential habitat that has not already been surveyed for Ute ladies' tresses within the project area shall be identified and surveyed prior to surface mining activities.

(d) Multiple Mineral Development

Operations will not be approved which, in the opinion of the Authorized Officer, would unreasonably interfere with the orderly development and/or production from a valid existing mineral lease issued prior to this one for the same lands.

(e) Oil and Gas/Coal Resources

The BLM realizes that coal mining operations conducted on Federal coal leases issued within producing oil and gas fields may interfere with the economic recovery of oil and gas; just as Federal oil and gas leases issued in a Federal coal lease area may inhibit coal recovery. The BLM retains the authority to alter and/or modify the resource recovery and protection plans for coal operations and/or oil and gas operations on those lands covered by Federal mineral leases so as to obtain maximum resource recovery.

(f) Resource Recovery and Protection

Notwithstanding the approval of a resource recovery and protection plan (R^2P^2) by the BLM, the lessor reserves the right to seek damages against the operator/lessee in the event (i) the operator/lessee fails to achieve maximum economic recovery (MER) (as defined at 43 CFR 3480.0-5(21)) of the recoverable coal reserves or (ii) the operator/lessee is determined to have caused a wasting of recoverable coal reserves. Damages shall be measured on the basis of the royalty that would have been payable on the wasted or unrecovered coal.

The parties recognize that under an approved R^2P^2, conditions may require a modification by the operator/lessee of that plan. In the event a coal bed or portion thereof is not to be mined or is rendered unmineable by the operation, the operator/lessee shall submit appropriate justification to obtain approval by the Authorized Officer to leave such reserves unmined. Upon approval by the Authorized Officer, such coal beds or portions thereof shall not be subject to damages as

described above. Further, nothing in this section shall prevent the operator/lessee from exercising its right to relinquish all or portion of the lease as authorized by statute and regulation.

In the event the Authorized Officer determines that the R^2P^2, as approved, will not attain MER as the result of changed conditions, the Authorized Officer will give proper notice to the operator/lessee as required under applicable regulations. The Authorized Officer will order a modification if necessary, identifying additional reserves to be mined in order to attain MER. Upon a final administrative or judicial ruling upholding such an ordered modification, any reserves left unmined (wasted) under that plan will be subject to damages as described in the first paragraph under this section.

Subject to the right to appeal hereinafter set forth, payment of the value of the royalty on such unmined recoverable coal reserves shall become due and payable upon determination by the Authorized Officer that the coal reserves have been rendered unmineable or at such time that the operator/lessee has demonstrated an unwillingness to extract the coal.

The BLM may enforce this provision either by issuing a written decision requiring payment of the Mineral Management Service demand for such royalties, or by issuing a notice of non-compliance. A decision or notice of non-compliance issued by the lessor that payment is due under this stipulation is appealable as allowed by law.

(g) Public Land Survey Protection

The lessee will protect all survey monuments, witness corners, reference monuments, and bearing trees against destruction, obliteration, or damage during operations on the lease areas. If any monuments, corners or accessories are destroyed, obliterated, or damaged by this operation, the lessee will hire an appropriate county surveyor or registered land surveyor to reestablish or restore the monuments, corners, or accessories at the same location, using surveying procedures in accordance with the "Manual of Surveying Instructions for the Survey of the Public Lands of the United States." The survey will be recorded in the appropriate county records, with a copy sent to the Authorized Officer.

(h) Buffer Zones for Rights-of-Way of Public Roads, School Buildings, and Occupied Dwellings

(1) No mining activity of any kind may be conducted within the Collins or McGee road rights-of-way and associated 100-foot buffer zones. The lessee shall recover all legally and economically recoverable coal from all leased lands not within the foregoing rights-of-way and associated buffer zones. Provided a permit to move the roads is approved by the Campbell County Board of Commissioners, the lessee shall recover all legally and economically recoverable coal from all leased lands within the foregoing rights-of-way and associated buffer zones. The lessee shall pay all royalties on any legally and economically recoverable coal that it fails to mine without the written permission of the Authorized Officer.

(2) No mining activity of any kind may be conducted within occupied residence and associated 100-foot buffer zone. The lessee shall recover all legally and economically recoverable coal from all leased lands not within the foregoing occupied residence and associated buffer zone. Provided a permit to move the cemetery is approved by the Campbell County Cemetery District, the lessee shall recover all legally and economically recoverable coal from all leased lands within the foregoing cemetery and associated buffer zone. The lessee shall pay all royalties on any legally and economically recoverable coal that it fails to mine without the written permission of the Authorized Officer.

APPENDIX F

CBNG AND CONVENTIONAL OIL AND GAS WELLS CAPABLE OF PRODUCTION IN THE GENERAL ANALYSIS AREA

APPENDIX F: CBNG AND CONVENTIONAL OIL AND GAS WELLS CAPABLE OF PRODUCTION IN THE GENERAL ANALYSIS AREA

API Number	Well Name	Company	Location										WOGCC Status	Gas MCF	Water BBLS
531855	HALL - NO. 13C-622	BLACKSTONE OPERATING INC	NW	1/4	SW	1/4	Sec	6	52 N	72 W			PS	121,383	135,842
532495	FRANKLIN - NO. 24C-622	BLACKSTONE OPERATING INC	SE	1/4	SW	1/4	Sec	6	52 N	72 W			PS	81,449	341,035
532823	HALL - NO. 12C-622	BLACKSTONE OPERATING INC	SW	1/4	NW	1/4	Sec	6	52 N	72 W			PS	159,507	366,692
532824	FRANKLIN - NO. 23C-622	BLACKSTONE OPERATING INC	NE	1/4	SW	1/4	Sec	6	52 N	72 W			PS	95,851	186,499
533102	FRANKLIN - NO. 33C-622	BLACKSTONE OPERATING INC	NW	1/4	SE	1/4	Sec	6	52 N	72 W			PS	124,372	172,496
533263	FRANKLIN - NO. 14C-622	BLACKSTONE OPERATING INC	SW	1/4	SW	1/4	Sec	6	52 N	72 W			PS	81,444	300,449
533412	FRANKLIN - NO. 34C-622	BLACKSTONE OPERATING INC	SW	1/4	SE	1/4	Sec	6	52 N	72 W			PS	78,230	119,336
533932	FRANKLIN - NO. 43C-622	BLACKSTONE OPERATING INC	NE	1/4	SE	1/4	Sec	6	52 N	72 W			PS	82,874	0
534847	FRANKLIN - NO. 44C-622	BLACKSTONE OPERATING INC	SE	1/4	SE	1/4	Sec	6	52 N	72 W			SI	10,396	7,913
539851	LANDECK - NO. 32C-622	BLACKSTONE OPERATING INC	SW	1/4	NE	1/4	Sec	6	52 N	72 W			PS	84,613	0
532180	OEDEKOVEN - NO. 11C-722	BLACKSTONE OPERATING INC	NW	1/4	NW	1/4	Sec	7	52 N	72 W			PS	63,518	280,080
532181	OEDEKOVEN - NO. 13C-722	BLACKSTONE OPERATING INC	NW	1/4	SW	1/4	Sec	7	52 N	72 W			PS	72,789	185,190
532183	OEDEKOVEN - NO. 22C-722	BLACKSTONE OPERATING INC	SE	1/4	NW	1/4	Sec	7	52 N	72 W			PS	111,840	150,074
532494	FRANKLIN - NO. 24C-722	BLACKSTONE OPERATING INC	SE	1/4	SW	1/4	Sec	7	52 N	72 W			PS	98,315	175,506
533103	OEDEKOVEN - NO. 33C-722	BLACKSTONE OPERATING INC	NW	1/4	SE	1/4	Sec	7	52 N	72 W			PS	83,843	183,424
533413	FRANKLIN - NO. 42C-722	BLACKSTONE OPERATING INC	SE	1/4	NE	1/4	Sec	7	52 N	72 W			PS	230,948	98,166
533414	FRANKLIN - NO. 41C-722	BLACKSTONE OPERATING INC	NE	1/4	NE	1/4	Sec	7	52 N	72 W			PS	244,254	31,518
534651	FRANKLIN - NO. 14C-722	BLACKSTONE OPERATING INC	SW	1/4	SW	1/4	Sec	7	52 N	72 W			PS	27,870	140,417
538705	OEDEKOVEN - NO. 21C-722	BLACKSTONE OPERATING INC	NE	1/4	NW	1/4	Sec	7	52 N	72 W			PS	19,762	36,156
536570	TAYLOR - NO. 21C-822	BLACKSTONE OPERATING INC	NE	1/4	NW	1/4	Sec	8	52 N	72 W			PS	21,651	47,635

API Number	Well Name	Company	Location	WOGCC Status	Gas MCF	Water BBLS
536757	TAYLOR - NO. 12C-822	BLACKSTONE OPERATING INC	SW 1/4 NW 1/4 Sec 8 52 N 72 W	PS	167,514	80
553318	HALL - NO. 43C-822	BLACKSTONE OPERATING INC	NE 1/4 SE 1/4 Sec 8 52 N 72 W	PS	60,956	41,000
549231	TRITON - NO. 34AC-1722	BLACKSTONE OPERATING INC	SW 1/4 SE 1/4 Sec 17 52 N 72 W	SI	178,004	724,975
549232	TRITON - NO. 43AC-1722	BLACKSTONE OPERATING INC	NE 1/4 SE 1/4 Sec 17 52 N 72 W	SI	111,133	400,441
549233	TRITON - NO. 44AC-1722	BLACKSTONE OPERATING INC	SE 1/4 SE 1/4 Sec 17 52 N 72 W	SI	69,389	306,563
551182	TRITON - NO. 13C-1722	BLACKSTONE OPERATING INC	NW 1/4 SW 1/4 Sec 17 52 N 72 W	SI	62,196	0
551183	TRITON - NO. 14C-1722	BLACKSTONE OPERATING INC	SW 1/4 SW 1/4 Sec 17 52 N 72 W	SI	114,111	0
551185	TRITON - NO. 12C-1722	BLACKSTONE OPERATING INC	SW 1/4 NW 1/4 Sec 17 52 N 72 W	SI	90,978	0
532182	OEDEKOVEN - NO. 13C-1822	BLACKSTONE OPERATING INC	NW 1/4 SW 1/4 Sec 18 52 N 72 W	SI	92,863	219,635
532432	FRANKLIN - NO. 14C-1822	BLACKSTONE OPERATING INC	SW 1/4 SW 1/4 Sec 18 52 N 72 W	PS	207,892	207,583
532434	FRANKLIN - NO. 24A-1822	BLACKSTONE OPERATING INC	SE 1/4 SW 1/4 Sec 18 52 N 72 W	PS	195,615	410,008
532436	FRANKLIN - NO. 33C-1822	BLACKSTONE OPERATING INC	NW 1/4 SE 1/4 Sec 18 52 N 72 W	SI	51,196	935,318
532501	FRANKLIN - NO. 22C-1822	BLACKSTONE OPERATING INC	SE 1/4 NW 1/4 Sec 18 52 N 72 W	PS	148,749	197,409
532502	FRANKLIN - NO. 11C-1822	BLACKSTONE OPERATING INC	NW 1/4 NW 1/4 Sec 18 52 N 72 W	SI	57,310	139,916
533104	FRANKLIN - NO. 31C-1822	BLACKSTONE OPERATING INC	NW 1/4 NE 1/4 Sec 18 52 N 72 W	PS	125,735	473,661
535022	OEDEKOVEN - NO. 12C-1822	BLACKSTONE OPERATING INC	SW 1/4 NW 1/4 Sec 18 52 N 72 W	PS	62,599	177,945
535592	MCGEE - NO. 21C-1822	BLACKSTONE OPERATING INC	NE 1/4 NW 1/4 Sec 18 52 N 72 W	PS	64,077	169,394
547734	FRANKLIN - NO. 24CR-1822	BLACKSTONE OPERATING INC	SE 1/4 SW 1/4 Sec 18 52 N 72 W	PS	106,238	410,780
531397	TRITON - NO. 24C-1922	BLACKSTONE OPERATING INC	SE 1/4 SW 1/4 Sec 19 52 N 72 W	PS	249,295	159,132
531398	TRITON - NO. 14A-1922	BLACKSTONE OPERATING INC	SW 1/4 SW 1/4 Sec 19 52 N 72 W	PS	22,932	4,371
532163	OEDEKOVEN - NO. 11C-1922	BLACKSTONE OPERATING INC	NW 1/4 NW 1/4 Sec 19 52 N 72 W	PS	141,610	520,325
532411	FRANKLIN - NO. 31C-1922	BLACKSTONE OPERATING INC	NW 1/4 NE 1/4 Sec 19 52 N 72 W	PS	179,637	1,604,364
533494	BUCKSKIN - NO. 42C-1922	BLACKSTONE OPERATING INC	SE 1/4 NE 1/4 Sec 19 52 N 72 W	SI	175	132,944

API Number	Well Name	Company	Location	WOGCC Status	Gas MCF	Water BBLS
538839	TRITON - NO. 14C-1922	BLACKSTONE OPERATING INC	SW 1/4 SW 1/4 Sec 19 52 N 72 W	PS	65,974	186,303
533495	BUCKSKIN - NO. 12C-2022	BLACKSTONE OPERATING INC	SW 1/4 NW 1/4 Sec 20 52 N 72 W	PS	125,432	239,416
533496	BUCKSKIN - NO. 14C-2022	BLACKSTONE OPERATING INC	SW 1/4 SW 1/4 Sec 20 52 N 72 W	SI	231	7,374
533497	BUCKSKIN - NO. 13C-2022	BLACKSTONE OPERATING INC	NW 1/4 SW 1/4 Sec 20 52 N 72 W	SI	137	17,958
549234	TRITON - NO. 31AC-2022	BLACKSTONE OPERATING INC	NW 1/4 NE 1/4 Sec 20 52 N 72 W	SI	225,285	359,851
549235	TRITON - NO. 32AC-2022	BLACKSTONE OPERATING INC	SW 1/4 NE 1/4 Sec 20 52 N 72 W	SI	93,150	564,878
549236	TRITON - NO. 41AC-2022	BLACKSTONE OPERATING INC	NE 1/4 NE 1/4 Sec 20 52 N 72 W	SI	105,529	103,900
533493	BUCKSKIN - NO. 11C-2922	BLACKSTONE OPERATING INC	NW 1/4 NW 1/4 Sec 29 52 N 72 W	PS	77,267	495,376
533498	BUCKSKIN - NO. 21C-2922	BLACKSTONE OPERATING INC	NE 1/4 NW 1/4 Sec 29 52 N 72 W	SI	6,004	0
530083	ROUGH DRAW - NO. P30-14	BLACKSTONE OPERATING INC	SE 1/4 SW 1/4 Sec 30 52 N 72 W	PS	10,763	3,720
531028	OEDEKOVEN - NO. 32C-3022	BLACKSTONE OPERATING INC	SW 1/4 NE 1/4 Sec 30 52 N 72 W	PS	40,510	24,067
531240	TRITON - NO. 12C-3022	BLACKSTONE OPERATING INC	SW 1/4 NW 1/4 Sec 30 52 N 72 W	SI	123,028	437,847
531241	TRITON - NO. 13C-3022	BLACKSTONE OPERATING INC	NW 1/4 SW 1/4 Sec 30 52 N 72 W	PS	182,618	361,305
531243	TRITON - NO. 24C-3022	BLACKSTONE OPERATING INC	SE 1/4 SW 1/4 Sec 30 52 N 72 W	PS	186,775	378,861
531280	TRITON - NO. 14C-3022	BLACKSTONE OPERATING INC	SW 1/4 SW 1/4 Sec 30 52 N 72 W	PS	195,705	267,977
531402	TRITON - NO. 11A-3022	BLACKSTONE OPERATING INC	NW 1/4 NW 1/4 Sec 30 52 N 72 W	PS	139,085	0
531403	TRITON - NO. 12A-3022	BLACKSTONE OPERATING INC	SW 1/4 NW 1/4 Sec 30 52 N 72 W	PS	70,971	702
531404	TRITON - NO. 13A-3022	BLACKSTONE OPERATING INC	NW 1/4 SW 1/4 Sec 30 52 N 72 W	PS	39,382	3,600
531405	TRITON - NO. 14A-3022	BLACKSTONE OPERATING INC	SW 1/4 SW 1/4 Sec 30 52 N 72 W	PS	47,799	3,086
531439	TRITON - NO. 21C2	BLACKSTONE OPERATING INC	NE 1/4 NW 1/4 Sec 30 52 N 72 W	PS	173,059	423,907
531675	TRITON FEDERAL - NO. 22C	MAJESTIC PETROLEUM OPERATIONS INC	SE 1/4 NW 1/4 Sec 30 52 N 72 W	PS	150,679	239,193
532768	OEDEKOVEN - NO. 32C2-3022	BLACKSTONE OPERATING INC	SW 1/4 NE 1/4 Sec 30 52 N 72 W	PS	167,683	485,388
533499	BUCKSKIN - NO. 41C-3022	BLACKSTONE OPERATING INC	NE 1/4 NE 1/4 Sec 30 52 N 72 W	PS	130,651	291,125

API Number	Well Name	Company	Location	WOGCC Status	Gas MCF	Water BBLS
533500	BUCKSKIN - NO. 42C-3022	BLACKSTONE OPERATING INC	SE 1/4 NE 1/4 Sec 30 52 N 72 W	PS	44,089	349,312
550829	TRITON - NO. 24A-3022	BLACKSTONE OPERATING INC	SE 1/4 SW 1/4 Sec 30 52 N 72 W	PS	35,216	0
531029	MARQUISS - NO. 24A-3122	BLACKSTONE OPERATING INC	SE 1/4 SW 1/4 Sec 31 52 N 72 W	PS	113,260	0
531045	OEDEKOVEN - NO. 12A-3122	BLACKSTONE OPERATING INC	SW 1/4 NW 1/4 Sec 31 52 N 72 W	PS	124,280	5,839
531157	TRITON - NO. 11A-3122	BLACKSTONE OPERATING INC	NW 1/4 NW 1/4 Sec 31 52 N 72 W	PS	74,478	0
531163	TRITON - NO. 13A-3122	BLACKSTONE OPERATING INC	NW 1/4 SW 1/4 Sec 31 52 N 72 W	PS	28,158	0
531167	TRITON - NO. 22A-3122	BLACKSTONE OPERATING INC	SE 1/4 NW 1/4 Sec 31 52 N 72 W	PS	50,480	5,486
531220	TRITON - NO. 11C-3122	BLACKSTONE OPERATING INC	NW 1/4 NW 1/4 Sec 31 52 N 72 W	PS	168,644	200,163
531221	TRITON - NO. 22C-3122	BLACKSTONE OPERATING INC	SE 1/4 NW 1/4 Sec 31 52 N 72 W	PS	304,212	338,365
531222	CABALLO - NO. 24C-3122	BLACKSTONE OPERATING INC	SE 1/4 SW 1/4 Sec 31 52 N 72 W	PS	562,778	184,935
531399	TRITON - NO. 12C-3122	BLACKSTONE OPERATING INC	SW 1/4 NW 1/4 Sec 31 52 N 72 W	PS	170,168	119,414
531438	CABALLO - NO. 14C-31	BLACKSTONE OPERATING INC	SW 1/4 SW 1/4 Sec 31 52 N 72 W	PS	323,148	736,288
531817	TRITON - NO. 23A-3122	BLACKSTONE OPERATING INC	NE 1/4 SW 1/4 Sec 31 52 N 72 W	PS	65,028	0
541502	RAWHIDE - NO. 14-5	MEDALLION EXPLORATION	SE 1/4 SW 1/4 Sec 5 51 N 72 W	SI	9	2,291
541508	RAWHIDE - NO. 13-5	MEDALLION EXPLORATION	SW 1/4 SW 1/4 Sec 5 51 N 72 W	SI	210	2,204
531476	CABALLO - NO. 22C-612	DEVON ENERGY PRODUCTION COMPANY LP	SE 1/4 NW 1/4 Sec 6 51 N 72 W	SI	263,944	362,945
532613	CABALLO - NO. 21C-612	DEVON ENERGY PRODUCTION COMPANY LP	NE 1/4 NW 1/4 Sec 6 51 N 72 W	SI	309,754	359,022
533006	CABALLO STATE TFU - NO. 13A-612	DEVON ENERGY PRODUCTION COMPANY LP	NW 1/4 SW 1/4 Sec 6 51 N 72 W	SI	24,670	62
533265	CABALLO TFU - NO. 34C-612	DEVON ENERGY PRODUCTION COMPANY LP	SW 1/4 SE 1/4 Sec 6 51 N 72 W	SI	115,877	437,553
533319	CABALLO FEDERAL TFU - NO. 11C-612	DEVON ENERGY PRODUCTION COMPANY LP	NW 1/4 NW 1/4 Sec 6 51 N 72 W	PS	134,952	63,135
531855	HALL - NO. 13C-622	BLACKSTONE OPERATING INC	NW 1/4 SW 1/4 Sec 6 52 N 72 W	PS	121,383	135,842
532495	FRANKLIN - NO. 24C-622	BLACKSTONE OPERATING INC	SE 1/4 SW 1/4 Sec 6 52 N 72 W	PS	81,449	341,035

API Number	Well Name	Company	Location										WOGCC Status	Gas MCF	Water BBLS
532823	HALL - NO. 12C-622	BLACKSTONE OPERATING INC	SW	1/4	NW	1/4	Sec	6	52 N	72 W			PS	159,507	366,692
532824	FRANKLIN - NO. 23C-622	BLACKSTONE OPERATING INC	NE	1/4	SW	1/4	Sec	6	52 N	72 W			PS	95,851	186,499
533102	FRANKLIN - NO. 33C-622	BLACKSTONE OPERATING INC	NW 1/4		SE	1/4	Sec	6	52 N	72 W			PS	124,372	172,496
533263	FRANKLIN - NO. 14C-622	BLACKSTONE OPERATING INC	SW	1/4	SW	1/4	Sec	6	52 N	72 W			PS	81,444	300,449
533412	FRANKLIN - NO. 34C-622	BLACKSTONE OPERATING INC	SW	1/4	SE	1/4	Sec	6	52 N	72 W			PS	78,230	119,336
533932	FRANKLIN - NO. 43C-622	BLACKSTONE OPERATING INC	NE	1/4	SE	1/4	Sec	6	52 N	72 W			PS	82,874	0
534847	FRANKLIN - NO. 44C-622	BLACKSTONE OPERATING INC	SE	1/4	SE	1/4	Sec	6	52 N	72 W			SI	10,396	7,913
539851	LANDECK - NO. 32C-622	BLACKSTONE OPERATING INC	SW	1/4	NE	1/4	Sec	6	52 N	72 W			PS	84,613	0
540285	DALY - NO. 11A-113	BLACKSTONE OPERATING INC	NW	1/4	NW	1/4	Sec	1	51 N	73 W			PG	51,521	112,711
532397	CABALLO - NO. 44C-113	DEVON ENERGY PRODUCTION COMPANY LP	SE	1/4	SE	1/4	Sec	1	51 N	73 W			PS	316,318	200,591
533009	CABALLO TFU - NO. 42C-113	DEVON ENERGY PRODUCTION COMPANY LP	SE	1/4	NE	1/4	Sec	1	51 N	73 W			SI	164,601	472,984
533010	CABALLO TFU - NO. 31C-113	DEVON ENERGY PRODUCTION COMPANY LP	NW 1/4		NE	1/4	Sec	1	51 N	73 W			SI	65,800	196,709
533894	20 MILE TFU - NO. 13C-113	DEVON ENERGY PRODUCTION COMPANY LP	NW 1/4		SW	1/4	Sec	1	51 N	73 W			SI	114,039	304,216
534597	DALY - NO. 23C-113	BLACKSTONE OPERATING INC	NE	1/4	SW	1/4	Sec	1	51 N	73 W			PS	101,441	219,802
534598	DALY - NO. 22C-113	BLACKSTONE OPERATING INC	SE	1/4	NW	1/4	Sec	1	51 N	73 W			PS	86,049	177,893
534599	DALY - NO. 11C-113	BLACKSTONE OPERATING INC	NW	1/4	NW	1/4	Sec	1	51 N	73 W			SI	97,690	169,034
534600	DALY - NO. 21C-113	BLACKSTONE OPERATING INC	NE	1/4	NW	1/4	Sec	1	51 N	73 W			PS	104,102	166,826
535179	DALY - NO. 33C-113	BLACKSTONE OPERATING INC	NW	1/4	SE	1/4	Sec	1	51 N	73 W			PS	134,385	62,364
537483	20 MILE - NO. 24A-113	DEVON ENERGY PRODUCTION COMPANY LP	SE	1/4	SW	1/4	Sec	1	51 N	73 W			PS	70,685	234,278
537484	20 MILE - NO. 24C-113	DEVON ENERGY PRODUCTION COMPANY LP	SE	1/4	SW	1/4	Sec	1	51 N	73 W			SI	119,949	132,627
540286	DALY - NO. 21A-113	BLACKSTONE OPERATING INC	NE	1/4	NW	1/4	Sec	1	51 N	73 W			PS	9,365	25,679
540287	DALY - NO. 23A-113	BLACKSTONE OPERATING INC	NE	1/4	SW	1/4	Sec	1	51 N	73 W			PS	44,643	13,138

API Number	Well Name	Company	Location	WOGCC Status	Gas MCF	Water BBLS
540288	DALY - NO. 22A-113	BLACKSTONE OPERATING INC	SE 1/4 NW 1/4 Sec 1 51 N 73 W	PS	30,643	34,640
540550	DALY - NO. 33A-113	BLACKSTONE OPERATING INC	NW 1/4 SE 1/4 Sec 1 51 N 73 W	SI	28,860	39,408
534604	DALY - NO. 11C-213	BLACKSTONE OPERATING INC	NW 1/4 NW 1/4 Sec 2 51 N 73 W	SI	35,053	182,993
535180	DALY - NO. 21C-213	BLACKSTONE OPERATING INC	NE 1/4 NW 1/4 Sec 2 51 N 73 W	SI	169,654	113,188
536515	DALY - NO. 22C-213	BLACKSTONE OPERATING INC	SE 1/4 NW 1/4 Sec 2 51 N 73 W	PS	235,809	185,098
537485	20 MILE - NO. 31C-213	DEVON ENERGY PRODUCTION COMPANY LP	NW 1/4 NE 1/4 Sec 2 51 N 73 W	SI	58,998	119,380
537486	20 MILE - NO. 31A-213	DEVON ENERGY PRODUCTION COMPANY LP	NW 1/4 NE 1/4 Sec 2 51 N 73 W	SI	20,621	159,517
537487	20 MILE - NO. 42C-213	DEVON ENERGY PRODUCTION COMPANY LP	SE 1/4 NE 1/4 Sec 2 51 N 73 W	SI	46,185	355,673
537488	20 MILE - NO. 42A-213	DEVON ENERGY PRODUCTION COMPANY LP	SE 1/4 NE 1/4 Sec 2 51 N 73 W	PS	107,076	11,140
538638	20 MILE - NO. 33A-213	DEVON ENERGY PRODUCTION COMPANY LP	NW 1/4 SE 1/4 Sec 2 51 N 73 W	SI	51,302	119,994
538713	20 MILE - NO. 33C-213	DEVON ENERGY PRODUCTION COMPANY LP	NW 1/4 SE 1/4 Sec 2 51 N 73 W	SI	221,577	469,491
540295	DALY - NO. 11A-213	BLACKSTONE OPERATING INC	NW 1/4 NW 1/4 Sec 2 51 N 73 W	PS	62,836	23,834
540551	DALY - NO. 21A-213	BLACKSTONE OPERATING INC	NE 1/4 NW 1/4 Sec 2 51 N 73 W	SI	80,764	20,196
531098	HALL - NO. 13C-123	DEVON ENERGY PRODUCTION COMPANY LP	NW 1/4 SW 1/4 Sec 1 52 N 73 W	PS	261,918	154,008
531099	HALL - NO. 23C-123	DEVON ENERGY PRODUCTION COMPANY LP	NE 1/4 SW 1/4 Sec 1 52 N 73 W	SI	162,596	168,204
532184	HALL - NO. 42C-123	BLACKSTONE OPERATING INC	SE 1/4 NE 1/4 Sec 1 52 N 73 W	PS	127,917	71,088
532185	HALL - NO. 44C-123	BLACKSTONE OPERATING INC	SE 1/4 SE 1/4 Sec 1 52 N 73 W	PS	115,792	255,284
532665	HALL - NO. 14C-123	DEVON ENERGY PRODUCTION COMPANY LP	SW 1/4 SW 1/4 Sec 1 52 N 73 W	PS	219,804	121,881
532666	HALL - NO. 31C-123	BLACKSTONE OPERATING INC	NW 1/4 NE 1/4 Sec 1 52 N 73 W	PS	209,361	126,816
532667	HALL - NO. 22C-123	DEVON ENERGY PRODUCTION COMPANY LP	SE 1/4 NW 1/4 Sec 1 52 N 73 W	PS	146,657	440,204

API Number	Well Name	Company	Location	WOGCC Status	Gas MCF	Water BBLS
532668	HALL - NO. 11C-123	DEVON ENERGY PRODUCTION COMPANY LP	NW 1/4 NW 1/4 Sec 1 52 N 73 W	PS	196,065	533,085
532732	HALL - NO. 33C-123	BLACKSTONE OPERATING INC	NW 1/4 SE 1/4 Sec 1 52 N 73 W	PS	256,223	102,466
532825	HALL - NO. 41C-123	BLACKSTONE OPERATING INC	NE 1/4 NE 1/4 Sec 1 52 N 73 W	PS	178,358	109,820
545439	HALL - NO. 41A-123	BLACKSTONE OPERATING INC	NE 1/4 NE 1/4 Sec 1 52 N 73 W	PS	10,567	0
553317	HALL - NO. 42A-123	BLACKSTONE OPERATING INC	SE 1/4 NE 1/4 Sec 1 52 N 73 W	PS	8,571	93,310
531048	HALL - NO. 31C-223	DEVON ENERGY PRODUCTION COMPANY LP	NW 1/4 NE 1/4 Sec 2 52 N 73 W	PS	323,206	941,372
531051	HALL - NO. 34C-223	DEVON ENERGY PRODUCTION COMPANY LP	SW 1/4 SE 1/4 Sec 2 52 N 73 W	SI	32,040	370,957
531052	HALL - NO. 43C-223	DEVON ENERGY PRODUCTION COMPANY LP	NE 1/4 SE 1/4 Sec 2 52 N 73 W	PS	265,148	693,211
533105	LANDECK - NO. 12C-223	DEVON ENERGY PRODUCTION COMPANY LP	SW 1/4 NW 1/4 Sec 2 52 N 73 W	PS	193,061	333,355
534792	LANDECK - NO. 14C-223	DEVON ENERGY PRODUCTION COMPANY LP	SW 1/4 SW 1/4 Sec 2 52 N 73 W	SI	219,639	393,528
535593	LANDECK - NO. 23C-223	DEVON ENERGY PRODUCTION COMPANY LP	NE 1/4 SW 1/4 Sec 2 52 N 73 W	PS	103,609	420,615
536142	LANDECK FED - NO. 21C-223	DEVON ENERGY PRODUCTION COMPANY LP	NE 1/4 NW 1/4 Sec 2 52 N 73 W	PS	80,482	140,086
544066	HALL - NO. 43WA-223	DEVON ENERGY PRODUCTION COMPANY LP	NE 1/4 SE 1/4 Sec 2 52 N 73 W	PS	22,398	290,727
544068	LANDECK - NO. 12WA-223	DEVON ENERGY PRODUCTION COMPANY LP	SW 1/4 NW 1/4 Sec 2 52 N 73 W	SI	13,784	67,081
544069	LANDECK - NO. 14WA-223	DEVON ENERGY PRODUCTION COMPANY LP	SW 1/4 SW 1/4 Sec 2 52 N 73 W	PS	182,816	178,325
545431	LANDECK - NO. 12A-223	DEVON ENERGY PRODUCTION COMPANY LP	SW 1/4 NW 1/4 Sec 2 52 N 73 W	PS	47,905	166,401
545432	LANDECK - NO. 14A-223	DEVON ENERGY PRODUCTION COMPANY LP	SW 1/4 SW 1/4 Sec 2 52 N 73 W	SI	27,879	0

API Number	Well Name	Company	Location									WOGCC Status	Gas MCF	Water BBLS
530937	LANDECK - NO. 34C-323	DEVON ENERGY PRODUCTION COMPANY LP	SW	1/4	SE	1/4	Sec	3	52 N	73	W	PS	255,635	376,042
531023	LANDECK - NO. 23C-323	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4	SW	1/4	Sec	3	52 N	73	W	PS	102,119	613,178
531025	LANDECK - NO. 43C-323	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4	SE	1/4	Sec	3	52 N	73	W	PS	259,118	371,488
531040	LANDECK - NO. 32C-323	DEVON ENERGY PRODUCTION COMPANY LP	SW	1/4	NE	1/4	Sec	3	52 N	73	W	SI	113,192	178,447
531858	LANDECK FED - NO. 14C-323	DEVON ENERGY PRODUCTION COMPANY LP	SW	1/4	SW	1/4	Sec	3	52 N	73	W	PS	223,299	1,067,318
532907	LANDECK - NO. 23WA-323	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4	SW	1/4	Sec	3	52 N	73	W	PS	38,594	1,039,972
533107	LANDECK - NO. 41C-323	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4	NE	1/4	Sec	3	52 N	73	W	PS	275,199	379,410
533713	LANDECK - NO. 24B-323	REDSTONE RESOURCES INC	SE	1/4	SW	1/4	Sec	3	52 N	73	W	SI	0	0
533714	LANDECK - NO. 34WA-323	DEVON ENERGY PRODUCTION COMPANY LP	SW	1/4	SE	1/4	Sec	3	52 N	73	W	PS	14,154	16,449
535501	LANDECK - NO. 24B2-323	DEVON ENERGY PRODUCTION COMPANY LP	SE	1/4	SW	1/4	Sec	3	52 N	73	W	PS	147,759	319,976
544049	LANDECK - NO. 43WA2-323	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4	SE	1/4	Sec	3	52 N	73	W	PS	267,761	273,267
544050	LANDECK - NO. 32WA-323	DEVON ENERGY PRODUCTION COMPANY LP	SW	1/4	NE	1/4	Sec	3	52 N	73	W	PS	82,702	334,203
545424	LANDECK - NO. 43A-323	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4	SE	1/4	Sec	3	52 N	73	W	SI	18,422	26,483
545426	LANDECK - NO. 34A-323	DEVON ENERGY PRODUCTION COMPANY LP	SW	1/4	SE	1/4	Sec	3	52 N	73	W	SI	41,519	16,951
545427	LANDECK - NO. 32A-323	DEVON ENERGY PRODUCTION COMPANY LP	SW	1/4	NE	1/4	Sec	3	52 N	73	W	PS	77,128	282,476
531744	LANDECK - NO. 21WA-1023	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4 NW		1/4	Sec 10		52 N	73	W	PS	459,324	663,863

API Number	Well Name	Company	Location							WOGCC Status	Gas MCF	Water BBLS
531877	LANDECK - NO. 21C-1023	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4	NW	1/4	Sec 10	52 N 73	W	PS	692,956	1,323,828
532326	HINKES - NO. 41C-1023	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4	NE	1/4	Sec 10	52 N 73	W	PS	352,366	922,495
532329	LANDECK - NO. 23C-1023	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4	SW	1/4	Sec 10	52 N 73	W	FL	147,285	1,061,655
532330	HINKES - NO. 43C-1023	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4	SE	1/4	Sec 10	52 N 73	W	FL	409,021	769,558
532331	HINKES - NO. 34C-1023	DEVON ENERGY PRODUCTION COMPANY LP	SW	1/4	SE	1/4	Sec 10	52 N 73	W	PS	445,392	792,442
532487	HINKES - NO. 32WA-1023	DEVON ENERGY PRODUCTION COMPANY LP	SW	1/4	NE	1/4	Sec 10	52 N 73	W	PS	274,450	1,096,039
544025	LANDECK - NO. 23WA-1023	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4	SW	1/4	Sec 10	52 N 73	W	PS	202,249	284,576
544028	HINKES - NO. 34WA-1023	DEVON ENERGY PRODUCTION COMPANY LP	SW	1/4	SE	1/4	Sec 10	52 N 73	W	PS	109,555	282,473
544081	LANDECK - NO. 21A-1023	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4	NW	1/4	Sec 10	52 N 73	W	SI	3,403	276,814
544082	HINKES - NO. 43A-1023	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4	SE	1/4	Sec 10	52 N 73	W	SI	132,200	45,322
544083	HINKES - NO. 41A-1023	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4	NE	1/4	Sec 10	52 N 73	W	PS	131,358	0
532328	HINKES - NO. 12C-1123	DEVON ENERGY PRODUCTION COMPANY LP	SW	1/4	NW	1/4	Sec 11	52 N 73	W	PS	151,696	350,683
532332	HINKES - NO. 14C-1123	DEVON ENERGY PRODUCTION COMPANY LP	SW	1/4	SW	1/4	Sec 11	52 N 73	W	PS	465,563	1,108,712
532532	HINKES - NO. 23WA-1123	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4	SW	1/4	Sec 11	52 N 73	W	PS	419,186	671,789
532644	HALL - NO. 41C-1123	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4	NE	1/4	Sec 11	52 N 73	W	SI	286,929	295,445
532662	TWENTY MILE - NO. 44C-1123	DEVON ENERGY PRODUCTION COMPANY LP	SE	1/4	SE	1/4	Sec 11	52 N 73	W	PS	250,401	1,051,565

API Number	Well Name	Company	Location							WOGCC Status	Gas MCF	Water BBLS
532663	HALL - NO. 32C-1123	DEVON ENERGY PRODUCTION COMPANY LP	SW	1/4	NE	1/4	Sec 11	52 N 73	W	SI	252,465	428,059
532664	HINKES - NO. 21C-1123	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4 NW		1/4	Sec 11	52 N 73	W	PS	331,721	461,004
538696	TWENTY MILE - NO. 34C-1123	DEVON ENERGY PRODUCTION COMPANY LP	SW	1/4	SE	1/4	Sec 11	52 N 73	W	SI	38,118	425,846
542579	HALL - NO. 41A-1123	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4	NE	1/4	Sec 11	52 N 73	W	SI	15,446	44,693
542658	TWENTY MILE - NO. 43A-1123	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4	SE	1/4	Sec 11	52 N 73	W	PS	36,848	246,325
543134	HINKES - NO. 14A-1123	DEVON ENERGY PRODUCTION COMPANY LP	SW	1/4	SW	1/4	Sec 11	52 N 73	W	SI	106,482	65,673
543139	HINKES - NO. 12A-1123	DEVON ENERGY PRODUCTION COMPANY LP	SW	1/4 NW		1/4	Sec 11	52 N 73	W	SI	50,364	170,258
544024	HALL - NO. 32WA-1123	DEVON ENERGY PRODUCTION COMPANY LP	SW	1/4	NE	1/4	Sec 11	52 N 73	W	PS	87,627	154,202
544030	TWENTY MILE - NO. 43WA-1123	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4	SE	1/4	Sec 11	52 N 73	W	SI	18,651	234,048
544035	TWENTY MILE - NO. 34WA-1123	DEVON ENERGY PRODUCTION COMPANY LP	SW	1/4	SE	1/4	Sec 11	52 N 73	W	SI	2,422	369,985
544054	HINKES - NO. 21WA-1123	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4 NW		1/4	Sec 11	52 N 73	W	SI	0	0
544084	HALL - NO. 32A-1123	DEVON ENERGY PRODUCTION COMPANY LP	SW	1/4	NE	1/4	Sec 11	52 N 73	W	PS	9,574	762,794
544098	HINKES - NO. 23A-1123	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4	SW	1/4	Sec 11	52 N 73	W	PS	46,278	289,553
544100	TWENTY MILE - NO. 43C-1123	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4	SE	1/4	Sec 11	52 N 73	W	PS	14,522	14,718
532404	COOK - NO. 14C-1223	BLACKSTONE OPERATING INC	SW	1/4	SW	1/4	Sec 12	52 N 73	W	PS	229,509	48,617
532405	COOK - NO. 13C-1223	BLACKSTONE OPERATING INC	NW 1/4		SW	1/4	Sec 12	52 N 73	W	PS	356,804	421,483
532407	COOK - NO. 11C-1223	BLACKSTONE OPERATING INC	NW 1/4		NW	1/4	Sec 12	52 N 73	W	PS	464,210	464,994

API Number	Well Name	Company	Location	WOGCC Status	Gas MCF	Water BBLS
532408	COOK - NO. 12C-1223	BLACKSTONE OPERATING INC	SW 1/4 NW 1/4 Sec 12 52 N 73 W	PS	188,036	121,678
532417	COOK - NO. 21C-1223	BLACKSTONE OPERATING INC	NE 1/4 NW 1/4 Sec 12 52 N 73 W	PS	168,554	66,851
532418	COOK - NO. 22C-1223	BLACKSTONE OPERATING INC	SE 1/4 NW 1/4 Sec 12 52 N 73 W	PS	375,724	414,300
532420	COOK - NO. 24C-1223	BLACKSTONE OPERATING INC	SE 1/4 SW 1/4 Sec 12 52 N 73 W	PS	277,086	229,700
532421	COOK - NO. 31W-1223	BLACKSTONE OPERATING INC	NW 1/4 NE 1/4 Sec 12 52 N 73 W	SI	45,024	205,746
532423	COOK - NO. 33C-1223	BLACKSTONE OPERATING INC	NW 1/4 SE 1/4 Sec 12 52 N 73 W	PS	192,944	269,057
532424	COOK - NO. 34C-1223	BLACKSTONE OPERATING INC	SW 1/4 SE 1/4 Sec 12 52 N 73 W	PS	119,996	45,491
532425	COOK - NO. 41C-1223	BLACKSTONE OPERATING INC	NE 1/4 NE 1/4 Sec 12 52 N 73 W	PS	34,679	163,774
532428	COOK - NO. 44C-1223	BLACKSTONE OPERATING INC	SE 1/4 SE 1/4 Sec 12 52 N 73 W	SI	500	35,738
542577	COOK - NO. 12A-1223	BLACKSTONE OPERATING INC	SW 1/4 NW 1/4 Sec 12 52 N 73 W	PS	114,881	45,612
542578	COOK - NO. 14A-1223	BLACKSTONE OPERATING INC	SW 1/4 SW 1/4 Sec 12 52 N 73 W	PS	154,272	253,940
544954	COOK - NO. 23A-1223R	BLACKSTONE OPERATING INC	NE 1/4 SW 1/4 Sec 12 52 N 73 W	PS	24,053	501,863
547796	COOK - NO. 12W-1223	BLACKSTONE OPERATING INC	SW 1/4 NW 1/4 Sec 12 52 N 73 W	PS	3,335	39,556
548356	COOK - NO. 34A-1223	BLACKSTONE OPERATING INC	SW 1/4 SE 1/4 Sec 12 52 N 73 W	SI	0	327,378
548360	COOK - NO. 21A1-1223	BLACKSTONE OPERATING INC	NE 1/4 NW 1/4 Sec 12 52 N 73 W	SI	2,074	6,626
531992	OEDEKOVEN - NO. 44C-1323	BLACKSTONE OPERATING INC	SE 1/4 SE 1/4 Sec 13 52 N 73 W	PS	105,599	600,376
532077	OEDEKOVEN - NO. 23C-1323	BLACKSTONE OPERATING INC	NE 1/4 SW 1/4 Sec 13 52 N 73 W	PS	173,923	485,734
532078	OEDEKOVEN - NO. 34C-1323	BLACKSTONE OPERATING INC	SW 1/4 SE 1/4 Sec 13 52 N 73 W	PS	52,048	864,161
532088	COOK - NO. 31C-1323	DEVON ENERGY PRODUCTION COMPANY LP	NW 1/4 NE 1/4 Sec 13 52 N 73 W	SI	134,079	108,504
532186	COOK - NO. 42C-1323	BLACKSTONE OPERATING INC	SE 1/4 NE 1/4 Sec 13 52 N 73 W	SI	651	651,193
532262	OEDEKOVEN - NO. 24C-1323	BLACKSTONE OPERATING INC	SE 1/4 SW 1/4 Sec 13 52 N 73 W	SI	170,891	518,836
532661	COOK - NO. 11C-1323	DEVON ENERGY PRODUCTION COMPANY LP	NW 1/4 NW 1/4 Sec 13 52 N 73 W	PS	289,721	178,635

API Number	Well Name	Company	Location	WOGCC Status	Gas MCF	Water BBLS
532734	COOK - NO. 22C-1323	REDSTONE RESOURCES INC	SE 1/4 NW 1/4 Sec 13 52 N 73 W	SI	3,281	19,455
543132	COOK - NO. 41A-1323	BLACKSTONE OPERATING INC	NE 1/4 NE 1/4 Sec 13 52 N 73 W	SI	0	0
543133	COOK - NO. 32A-1323	BLACKSTONE OPERATING INC	SW 1/4 NE 1/4 Sec 13 52 N 73 W	PS	32,018	339
543135	OEDEKOVEN - NO. 23A-1323	BLACKSTONE OPERATING INC	NE 1/4 SW 1/4 Sec 13 52 N 73 W	PS	96,921	24,940
543145	OEDEKOVEN - NO. 34A-1323	BLACKSTONE OPERATING INC	NW 1/4 SE 1/4 Sec 13 52 N 73 W	PS	92,029	5
535595	TWENTY MILE - NO. 14C-1423	DEVON ENERGY PRODUCTION COMPANY LP	SW 1/4 SW 1/4 Sec 14 52 N 73 W	PS	194,384	584,948
538618	HUSKINSON - NO. 34WA-1423	DEVON ENERGY PRODUCTION COMPANY LP	SW 1/4 SE 1/4 Sec 14 52 N 73 W	SI	104,499	364,942
538838	TWENTY MILE - NO. 32WA-1423	DEVON ENERGY PRODUCTION COMPANY LP	SW 1/4 NE 1/4 Sec 14 52 N 73 W	SI	83,546	470,314
539441	TWENTY MILE - NO. 12C2-1423	DEVON ENERGY PRODUCTION COMPANY LP	SW 1/4 NW 1/4 Sec 14 52 N 73 W	PS	60,724	0
532187	TWENTY MILE - NO. 41C-1523	DEVON ENERGY PRODUCTION COMPANY LP	NE 1/4 NE 1/4 Sec 15 52 N 73 W	PS	372,652	1,459,850
535098	TWENTY MILE - NO. 43C-1523	DEVON ENERGY PRODUCTION COMPANY LP	NE 1/4 SE 1/4 Sec 15 52 N 73 W	SI	264,387	314,467
535100	TWENTY MILE - NO. 32C-1523	DEVON ENERGY PRODUCTION COMPANY LP	SW 1/4 NE 1/4 Sec 15 52 N 73 W	PS	196,639	881,752
544022	TWENTY MILE - NO. 34A-1523	DEVON ENERGY PRODUCTION COMPANY LP	SW 1/4 SE 1/4 Sec 15 52 N 73 W	SI	96,819	27,989
544074	TWENTY MILE - NO. 43A-1523	DEVON ENERGY PRODUCTION COMPANY LP	NE 1/4 SE 1/4 Sec 15 52 N 73 W	PS	108,433	31,468
544075	TWENTY MILE - NO. 41A-1523	DEVON ENERGY PRODUCTION COMPANY LP	NE 1/4 NE 1/4 Sec 15 52 N 73 W	PS	162,333	82,419
544076	TWENTY MILE - NO. 32A-2223	DEVON ENERGY PRODUCTION COMPANY LP	SW 1/4 NE 1/4 Sec 22 52 N 73 W	PS	283,506	27,926
544077	TWENTY MILE - NO. 41A-2223	DEVON ENERGY PRODUCTION COMPANY LP	NE 1/4 NE 1/4 Sec 22 52 N 73 W	PS	234,920	58,657

API Number	Well Name	Company	Location	WOGCC Status	Gas MCF	Water BBLS
536562	TWENTY MILE FEDERAL - NO. 34C-2223	DEVON ENERGY PRODUCTION COMPANY LP	SW 1/4 SE 1/4 Sec 22 52 N 73 W	PS	77,651	250,842
536565	TWENTY MILE FED - NO. 43C-2223	DEVON ENERGY PRODUCTION COMPANY LP	NE 1/4 SE 1/4 Sec 22 52 N 73 W	PS	243,147	206,462
535096	TWENTY MILE - NO. 41C-2223	DEVON ENERGY PRODUCTION COMPANY LP	NE 1/4 NE 1/4 Sec 22 52 N 73 W	PS	390,982	819,043
532657	TRITON - NO. 42C-2323	BLACKSTONE OPERATING INC	SE 1/4 NE 1/4 Sec 23 52 N 73 W	PS	370,104	252,779
535597	TRITON - NO. 43C-2323	DEVON ENERGY PRODUCTION COMPANY LP	NE 1/4 SE 1/4 Sec 23 52 N 73 W	PS	152,550	25,511
536248	MOREL - NO. 41C-2323	BLACKSTONE OPERATING INC	NE 1/4 NE 1/4 Sec 23 52 N 73 W	PS	72,690	6,062
536561	TWENTY MILE FEDERAL - NO. 14C-2323	DEVON ENERGY PRODUCTION COMPANY LP	SW 1/4 SW 1/4 Sec 23 52 N 73 W	PS	73,670	293,972
543661	TWENTY MILE - NO. 21C-2323	DEVON ENERGY PRODUCTION COMPANY LP	NE 1/4 NW 1/4 Sec 23 52 N 73 W	PS	112,476	335,780
551906	MOREL - NO. 41A-2323	BLACKSTONE OPERATING INC	NE 1/4 NE 1/4 Sec 23 52 N 73 W	PS	9,931	0
536247	MOREL - NO. 12C-2423	BLACKSTONE OPERATING INC	SW 1/4 NW 1/4 Sec 24 52 N 73 W	SI	137,368	437,140
531501	TRITON - NO. 44EC-2423	BLACKSTONE OPERATING INC	SE 1/4 SE 1/4 Sec 24 52 N 73 W	PS	186,047	324,422
531502	OEDEKOVEN - NO. 34C-2423	BLACKSTONE OPERATING INC	SW 1/4 SE 1/4 Sec 24 52 N 73 W	PS	200,502	241,257
531804	OEDEKOVEN - NO. 42C-2423	BLACKSTONE OPERATING INC	SE 1/4 NE 1/4 Sec 24 52 N 73 W	PS	111,618	406,599
531805	OEDEKOVEN - NO. 33EC	BLACKSTONE OPERATING INC	NW 1/4 SE 1/4 Sec 24 52 N 73 W	SI	10,886	46,986
531822	OEDEKOVEN - NO. 41C-2423	BLACKSTONE OPERATING INC	NE 1/4 NE 1/4 Sec 24 52 N 73 W	PS	44,675	693,047
532079	OEDEKOVEN - NO. 21C-2423	BLACKSTONE OPERATING INC	NE 1/4 NW 1/4 Sec 24 52 N 73 W	PS	336,353	389,630
532213	OEDEKOVEN - NO. 23C-2423	BLACKSTONE OPERATING INC	NE 1/4 SW 1/4 Sec 24 52 N 73 W	PS	287,348	674,762
532293	OEDEKOVEN - NO. 43C2-24	BLACKSTONE OPERATING INC	NE 1/4 SE 1/4 Sec 24 52 N 73 W	PS	704	3,420

API Number	Well Name	Company	Location							WOGCC Status	Gas MCF	Water BBLS
535598	TRITON - NO. 14C-2423	DEVON ENERGY PRODUCTION COMPANY LP	SW	1/4	SW	1/4	Sec 24	52 N 73	W	SI	64,017	348,396
532660	OEDEKOVEN - NO. 43C3-2423	BLACKSTONE OPERATING INC	NE	1/4	SE	1/4	Sec 24	52 N 73	W	PS	146,013	355,466
532395	OEDEKOVEN - NO. 31C-2423	BLACKSTONE OPERATING INC	NW 1/4		NE	1/4	Sec 24	52 N 73	W	PS	72,483	785,499
532769	OEDEKOVEN - NO. 33C2-2423	BLACKSTONE OPERATING INC	NW 1/4		SE	1/4	Sec 24	52 N 73	W	PS	202,124	202,178
534701	TRITON - NO. 11A-2523	DEVON ENERGY PRODUCTION COMPANY LP	NW 1/4		NW	1/4	Sec 25	52 N 73	W	SI	8,865	254,744
534707	COLEMAN - NO. 13A-2523	REDSTONE RESOURCES INC	NW 1/4		SW	1/4	Sec 25	52 N 73	W	SI	0	0
534708	HOLDEN - NO. 14C-2523	DEVON ENERGY PRODUCTION COMPANY LP	SW	1/4	SW	1/4	Sec 25	52 N 73	W	PS	106,197	32,728
535009	WAARE - NO. 12C-2523	DEVON ENERGY PRODUCTION COMPANY LP	SW	1/4	NW	1/4	Sec 25	52 N 73	W	PS	91,265	162,299
532101	TRITON - NO. 32C-2523	BLACKSTONE OPERATING INC	SW	1/4	NE	1/4	Sec 25	52 N 73	W	SI	105	3,737
532188	TRITON - NO. 21C-2523	BLACKSTONE OPERATING INC	NE	1/4	NW	1/4	Sec 25	52 N 73	W	SI	198,386	607,101
531752	TRITON - NO. 44C-2523	BLACKSTONE OPERATING INC	SE	1/4	SE	1/4	Sec 25	52 N 73	W	SI	98,987	1,014
531753	TRITON - NO. 41C-2523	BLACKSTONE OPERATING INC	NE	1/4	NE	1/4	Sec 25	52 N 73	W	PS	138,165	319,676
531801	TRITON - NO. 22A-2523	REDSTONE RESOURCES INC	SE	1/4	NW	1/4	Sec 25	52 N 73	W	SI	0	0
531162	TRITON - NO. 44A-2523	BLACKSTONE OPERATING INC	SE	1/4	SE	1/4	Sec 25	52 N 73 W		PS	21,324	0
531164	TRITON - NO. 42A-2523	BLACKSTONE OPERATING INC	SE	1/4	NE	1/4	Sec 25	52 N 73	W	PS	6,269	249,500
531165	TRITON - NO. 33A-2523	BLACKSTONE OPERATING INC	NW	1/4	SE	1/4	Sec 25	52 N 73	W	PS	39,626	0
531166	TRITON - NO. 43A-2523	BLACKSTONE OPERATING INC	NE	1/4	SE	1/4	Sec 25	52 N 73	W	PS	212	0
531400	TRITON - NO. 43C-2523	BLACKSTONE OPERATING INC	NE	1/4	SE	1/4	Sec 25	52 N 73	W	PS	360,486	133,197
551905	20 MILE - NO. 34A-2623	BLACKSTONE OPERATING INC	SW	1/4	SE	1/4	Sec 26	52 N 73	W	PS	165,900	31,240
548329	TWENTY MILE - NO. 14A-2623	DEVON ENERGY PRODUCTION COMPANY LP	SW	1/4	SW	1/4	Sec 26	52 N 73	W	PS	125,042	168,072

API Number	Well Name	Company	Location							WOGCC Status	Gas MCF	Water BBLS
539496	MOORE - NO. 43A-2623	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4	SE	1/4	Sec 26	52 N 73	W	PS	162,679	17,196
532090	TRITON - NO. 41C-2623	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4	NE	1/4	Sec 26	52 N 73	W	SI	0	0
532764	TRITON - NO. 21C-2623	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4 NW		1/4	Sec 26	52 N 73	W	SI	0	0
535025	TWENTY MILE - NO. 14C-2623	DEVON ENERGY PRODUCTION COMPANY LP	SW	1/4	SW	1/4	Sec 26	52 N 73	W	PS	972,914	715,822
549398	NORTH KITTY FEDERAL - NO. 44-27B	KENNEDY OIL	SE	1/4	SE	1/4	Sec 27	52 N 73	W	PS	46,543	160,074
549399	NORTH KITTY FEDERAL - NO. 33-27B	KENNEDY OIL	NW 1/4		SE	1/4	Sec 27	52 N 73	W	PS	34,300	58,412
550007	NORTH KITTY FEDERAL - NO. 34-27A	KENNEDY OIL	SW	1/4	SE	1/4	Sec 27	52 N 73	W	PS	143,371	67,181
535599	TWENTY MILE - NO. 23C-3523	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4	SW	1/4	Sec 35	52 N 73	W	PS	130,479	809,828
535799	DALY - NO. 33CX-3523	BLACKSTONE OPERATING INC	NW	1/4	SE	1/4	Sec 35	52 N 73	W	SI	57,575	70,062
534693	DALY - NO. 41C-3523	BLACKSTONE OPERATING INC	NE	1/4	NE	1/4	Sec 35	52 N 73	W	SI	229,211	162,406
534694	DALY - NO. 34C-3523	BLACKSTONE OPERATING INC	SW	1/4	SE	1/4	Sec 35	52 N 73	W	SI	67,290	269,424
534695	DALY - NO. 44C-3523	BLACKSTONE OPERATING INC	SE	1/4	SE	1/4	Sec 35	52 N 73	W	SI	115,276	54,898
534697	DALY - NO. 43C-3523	BLACKSTONE OPERATING INC	NE	1/4	SE	1/4	Sec 35	52 N 73	W	SI	108,075	34,012
534698	DALY - NO. 32C-3523	BLACKSTONE OPERATING INC	SW	1/4	NE	1/4	Sec 35	52 N 73	W	PS	166,142	417,887
534699	DALY - NO. 42C-3523	BLACKSTONE OPERATING INC	SE	1/4	NE	1/4	Sec 35	52 N 73	W	SI	153,985	154,021
534700	DALY - NO. 31C-3523	BLACKSTONE OPERATING INC	NW	1/4	NE	1/4	Sec 35	52 N 73	W	PS	80,244	782,872
532730	TWENTY MILE - NO. 21C-3523	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4 NW		1/4	Sec 35	52 N 73	W	PS	413,875	273,353
535023	TWENTY MILE - NO. 12C-3523	DEVON ENERGY PRODUCTION COMPANY LP	SW	1/4 NW		1/4	Sec 35	52 N 73	W	PS	546,039	905,190
540284	DALY - NO. 44A-3523	BLACKSTONE OPERATING INC	SE	1/4	SE	1/4	Sec 35	52 N 73	W	SI	14,701	152,361
540296	DALY - NO. 43A-3523	BLACKSTONE OPERATING INC	NE	1/4	SE	1/4	Sec 35	52 N 73	W	SI	30,946	147,286

API Number	Well Name	Company	Location											WOGCC Status	Gas MCF	Water BBLS
540297	DALY - NO. 42A-3523	BLACKSTONE OPERATING INC	SE	1/4	NE	1/4	Sec	35	52	N	73	W		SI	5,932	89,783
540298	DALY - NO. 41A-3523	BLACKSTONE OPERATING INC	NE	1/4	NE	1/4	Sec	35	52	N	73	W		SI	19,184	250,509
540299	DALY - NO. 34A-3523	BLACKSTONE OPERATING INC	SW	1/4	SE	1/4	Sec	35	52	N	73	W		SI	60,044	18,154
540300	DALY - NO. 33A-3523	BLACKSTONE OPERATING INC	NW	1/4	SE	1/4	Sec	35	52	N	73	W		PS	85,057	56,046
540314	DALY - NO. 32A-3523	BLACKSTONE OPERATING INC	SW	1/4	NE	1/4	Sec	35	52	N	73	W		PS	125,372	52,143
540315	DALY - NO. 31A-3523	BLACKSTONE OPERATING INC	NW	1/4	NE	1/4	Sec	35	52	N	73	W		PS	162,723	23,031
538837	STATE - NO. 41C-3623	BLACKSTONE OPERATING INC	NE	1/4	NE	1/4	Sec	36	52	N	73	W		PS	36,817	5,260
551904	STATE - NO. 14A-3623	BLACKSTONE OPERATING INC	SW	1/4	SW	1/4	Sec 36		52 N		73	W		PS	27,088	85,400
533471	STATE - NO. 24C-3623	BLACKSTONE OPERATING INC	SE	1/4	SW	1/4	Sec	36	52	N	73	W		PS	181,937	574,462
531499	STATE - NO. 41A-3623	BLACKSTONE OPERATING INC	NE	1/4	NE	1/4	Sec	36	52	N	73	W		PS	22,085	5,089
531588	STATE - NO. 44C-3623	BLACKSTONE OPERATING INC	SE	1/4	SE	1/4	Sec	36	52	N	73	W		PS	155,320	1,264,619
531589	STATE - NO. 43C-3623	BLACKSTONE OPERATING INC	NE	1/4	SE	1/4	Sec	36	52	N	73	W		SI	205,007	819,875
531590	STATE - NO. 31C-3623	BLACKSTONE OPERATING INC	NW	1/4	NE	1/4	Sec	36	52	N	73	W		PS	351,141	278,375
531591	STATE - NO. 13C-3623	BLACKSTONE OPERATING INC	NW	1/4	SW	1/4	Sec	36	52	N	73	W		PS	446,507	927,324
531611	STATE - NO. 22EC-3623	BLACKSTONE OPERATING INC	SE	1/4	NW	1/4	Sec	36	52	N	73	W		PS	396,163	532,462
532260	STATE - NO. 21C-3623	BLACKSTONE OPERATING INC	NE	1/4	NW	1/4	Sec	36	52	N	73	W		PS	401,687	418,518
531802	STATE - NO. 11C-36	BLACKSTONE OPERATING INC	NW 1/4		NW	1/4	Sec 36		52 N		73	W		PS	359,877	441,239
531803	STATE - NO. 33C-3623	BLACKSTONE OPERATING INC	NW	1/4	SE	1/4	Sec	36	52	N	73	W		PS	404,811	996,721
531848	STATE - NO. 42C-3623	BLACKSTONE OPERATING INC	SE	1/4	NE	1/4	Sec	36	52	N	73	W		PS	252,778	518,696
531882	LYNDE - NO. 24C2-3032	DEVON ENERGY PRODUCTION COMPANY LP	SE	1/4	SW	1/4	Sec 30		53 N		72	W		PS	120,194	143,336
533407	LYNDE - NO. 14C-3032	DEVON ENERGY PRODUCTION COMPANY LP	SW	1/4	SW	1/4	Sec 30		53 N		72	W		PS	186,225	98,363
533416	LYNDE - NO. 23C-3032	DEVON ENERGY PRODUCTION COMPANY LP	NE	1/4	SW	1/4	Sec 30		53 N		72	W		PS	187,940	147,821
532960	HALL REDERAL - NO. 24C-2533	DEVON ENERGY PRODUCTION COMPANY LP	SE	1/4	SW	1/4	Sec 25		53 N		73	W		PS	7,298	0

API Number	Well Name	Company	Location	WOGCC Status	Gas MCF	Water BBLS
532091	LYNDE - NO. 44C-2533	DEVON ENERGY PRODUCTION COMPANY LP	SE 1/4 SE 1/4 Sec 25 53 N 73 W	PS	109,943	193,334
534846	LYNDE - NO. 34C-2533	DEVON ENERGY PRODUCTION COMPANY LP	SW 1/4 SE 1/4 Sec 25 53 N 73 W	PS	189,204	294,417
532984	HALL FEDERAL - NO. 33C-3533	DEVON ENERGY PRODUCTION COMPANY LP	NW 1/4 SE 1/4 Sec 35 53 N 73 W	PS	98,818	63,594
534795	HALL - NO. 44C-3533	DEVON ENERGY PRODUCTION COMPANY LP	SE 1/4 SE 1/4 Sec 35 53 N 73 W	PS	294,826	355,220
533908	STATE - NO. 44C-3633	BLACKSTONE OPERATING INC	SE 1/4 SE 1/4 Sec 36 53 N 73 W	PS	146,003	205,267
533910	STATE - NO. 33C-3633	BLACKSTONE OPERATING INC	NW 1/4 SE 1/4 Sec 36 53 N 73 W	PS	176,078	220,717

API = American petroleum institute; WOGCC = Wyoming Oil and Gas Conservation Commission; mcf = thousand cubic feet; bbls = barrels; PS = pumping submersible; SI = shut-in; PG = producing gas well; FL = flowing

APPENDIX G

AIR QUALITY TECHNICAL SUPPORT DOCUMENT

APPENDIX G: AIR QUALITY TECHNICAL SUPPORT DOCUMENT

Introduction

As part of the leasing and permitting process for the Hay Creek II lease by application (LBA) tract, the Buckskin Mine contracted with IML Air Science, a division of Inter-Mountain Laboratories, Inc., to assess potential air quality impacts from mining the proposed tract or an alternative tract configuration within the general analysis area. A portion of the information in this air quality appendix is taken from the Air Quality Technical Support Document (McVehil-Monnett Associates, Inc. 2007) prepared for the West Antelope II Coal Lease Application Environmental Impact Statement (EIS). This information has been updated to current conditions by Inter-Mountain Labs, Inc.

The purpose of this appendix is to provide background information on air quality issues, including the regulatory framework, regional air quality conditions, dispersion model methodologies, and the best available control technology (BACT) process. The actual analyses of known and potential impacts under various alternatives considered in the Hay Creek II LBA EIS appear in section 3.4 of that document. The information presented in the EIS and this technical support document is focused primarily on impacts from emission sources at the Buckskin Mine, the applicant in the EIS. Emissions from neighboring mines are accounted for in the regional monitoring and near-field dispersion modeling discussions. Analysis methods used in preparing this Air Quality Technical Support Document meet or exceed the BLM's "Data Adequacy Standards for the Powder River Coal Region" (BLM 1987) and include use of recent and extensive air quality modeling analyses conducted at the Buckskin Mine by IML Air Science for recent permitting actions.

Regulatory Background

Ambient air quality and air pollution emissions are regulated under federal and state laws and regulations. The Wyoming Department of Environmental Quality/Air Quality Division (WDEQ/AQD) is responsible for managing air quality through the Wyoming Air Quality Standards and Regulations and the Wyoming State Implementation Plan. The WDEQ/AQD has also been delegated authority by the U.S. Environmental Protection Agency (EPA) to implement federal programs of the Clean Air Act Amendments of 1990.

The WDEQ/AQD implements the Wyoming Air Quality Standards and Regulations and Clean Air Act Amendments through various air permitting programs. A proponent initiating a project must undergo new source review and obtain a pre-construction permit or a permit waiver authorizing construction of the project. This process ensures that the project will comply with the air quality requirements at the time of construction. To ensure ongoing compliance, the WDEQ/AQD also implements an operating permit program that can require ongoing monitoring of emissions sources and/or source control systems.

National Ambient Air Quality Standards

The Clean Air Act (CAA) requires the EPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health and welfare. These standards define the maximum level of air pollution allowed in the ambient air. The CAA established NAAQS for six pollutants, known as "criteria" pollutants, which "… cause or contribute to air pollution which may be reasonably anticipated to endanger public health or welfare and the presence of which in the ambient air results from numerous or diverse mobile or stationary sources." The six, present-day criteria pollutants are lead, nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3) and particulate matter (PM_{10} and $PM_{2.5}$), where PM_{10} is coarse particulate with mean aerodynamic diameters less than 10 microns and $PM_{2.5}$ is fine particulate with a diameter of 2.5 microns or less.

The CAA and Clean Air Act Amendments allow states to promulgate additional ambient air standards that are at least as stringent, or more stringent, than the NAAQS. The NAAQS and Wyoming Ambient Air Quality Standards (WAAQS), set by the WDEQ/AQD, are listed in table G-1. In some instances, the Wyoming standards are more stringent than the national standards.

During the new source review process, applicants must demonstrate that the facility will not cause or significantly contribute to exceedance of these standards. These demonstrations are made via atmospheric dispersion modeling or other means, including monitoring data approved by the WDEQ/AQD administrator.

The federal standard for particulate matter pollutant was specified as total suspended particles (TSP) until 1987. This measurement included all particulates generally less than 100 microns in diameter. In 1987, the form of the federal standard was changed from TSP to PM_{10} to better reflect human health effects. Wyoming added the PM_{10} standard in 1989, but also retained the TSP standard until March 2000. In 1997, the EPA set separate standards for fine particles ($PM_{2.5}$), based on their link to serious health problems. The EPA adopted an interim $PM_{2.5}$ standard in April 2005, and that standard was later modified in September 2006. That year, the EPA again revised the air quality standards for particulate matter by tightening the 24-hour $PM_{2.5}$ standard from the previous level of 65 micrograms per cubic meter ($\mu g/m^3$) to 35 $\mu g/m^3$ and revoking the annual PM_{10} standard of 50 $\mu g/m^3$. The EPA retained the existing annual $PM_{2.5}$ standard of 15 $\mu g/m^3$ and the 24-hour PM_{10} standard of 150 $\mu g/m^3$. These revisions took effect on December 18, 2006. In view of the December 2006 revisions to the NAAQS for particulate matter, the State of Wyoming entered into rulemaking to revise the WAAQS for particulate matter so that they remain as stringent as or more stringent than the NAAQS. The current Wyoming and federal ambient air standards for PM_{10} and $PM_{2.5}$ are shown in table G-1. The old TSP standard has not been part of Wyoming's monitoring requirements for more than 10 years. The $PM_{2.5}$ standard is not currently applied to modeling of surface mine emissions. Therefore, any discussion of particulate modeling in Wyoming is confined to PM_{10} emissions. Even with the evolution of state or federal small size particulate standards, TSP is still monitored in some PRB locations.

Table G-1. Six Criteria Air Pollutant Concentrations and Applicable Standards in the Powder River Basin (µg/m³)

Criteria Pollutant	Averaging Time[1]	Background Concentration	Primary NAAQS[2]	Secondary NAAQS[2]	WAAQS	PSD Class I Increments	PSD Class II Increments
CO 1-ho	ur	3,336[4]	40,000	40,000	40,000	—	—
	8-hour	1,381	10,000	10,000	10,000	—	—
NO_2 Annu	al	5[5]	100 100	100		2.5	25
O_3 8-ho	ur	70[6]	147 147	147		—	—
SO_2 3-ho	ur	181[7]	—	1,300	1,300	25	512
	24-hour	62[7]	365	—	260	5	91
	Annual	13[7]	80	—	60	2	20
PM_{10}[8] 24-h	our	54[9]	150	150	150	8	30
	Annual	13[9]	—	—	50	4	17
$PM_{2.5}$[8] 24-h	our	13[10]	35	35	65	—	—
	Annual	4[10]	15	15	15	—	—

µg/m³ = micrograms per cubic meter; NAAQS = National Ambient Air Quality Standards; WAAQS = Wyoming Ambient Air Quality Standards; PSD = Prevention of Significant Deterioration increment values; CO = carbon monoxide; NO_2 = nitrogen dioxide; 0_3 = ozone; SO_2 = sulfur dioxide; PM_{10} = particulate matter measuring 10 microns or less in diameter; $PM_{2.5}$ = particulate matter measuring 2.5 microns or less in diameter.

1 Annual standards are not to be exceeded; short-term standards are not to be exceeded more than once per year.

2 Primary standards are designed to protect public health; secondary standards are designed to protect public welfare.

3 All NEPA analysis comparisons to the PSD increments are intended to evaluate a threshold of concern and do not represent a regulatory PSD Increment Consumption Analysis.

4 Data collected by Amoco at Ryckman Creek for an 8-month period during 1978–1979, summarized in Riley Ridge EIS (BLM 1983).

5 Data collected at Thunder Basin National Grassland, Campbell County, Wyoming in 2002.

6 Data collected at Thunder Basin National Grassland, Campbell County, Wyoming in 2002–2004 (8-hour 4th high).

7 Data collected by Black Hills Power & Light at Wygen 2, Campbell County, Wyoming in 2002.

8 On October 17, 2006, the EPA published final revisions to the NAAQS for particulate matter that took effect on December 18, 2006. The revision strengthens the 24-hour $PM_{2.5}$ standard from 65 to 35 µg/m³ and revokes the annual PM10 standard of 50 µg/m³. The State of Wyoming entered into rulemaking to revise the WAAQS.

9 Data collected at the Eagle Butte Mine, Campbell County, Wyoming in 2002.

10 Data collected at the Buckskin Mine 2002.

Source: BLM 2005a and WDEQ/AQD 2002 annual report for each mine, unless otherwise noted above.

Attainment/Non-Attainment Area Designations

Pursuant to the CAA, the EPA has developed a method for classifying existing air quality in distinct geographic regions known as air basins, or air quality control regions, and/or metropolitan statistical areas. For each federal criteria pollutant, each air basin (or portion of a basin or statistical area) is classified as in "attainment" if the area has "attained" compliance with the adopted NAAQS for that pollutant, or is classified as in "non-attainment" if the levels of ambient air pollution exceed the NAAQS for that pollutant. Areas for which sufficient ambient monitoring data are not available to define attainment status are designated as "unclassified" for those particular pollutants.

States use the EPA method to designate areas within their borders as being in "attainment" or "non-attainment" with the NAAQS. Most of the Wyoming PRB, including the general analysis area, is designated an attainment area for all pollutants. However, the town of Sheridan, Wyoming, located in Sheridan County about 100 miles northwest of the general analysis area, is a moderate non-attainment area for PM_{10} due to localized sources and activity. No other non-attainment areas are within 150 miles of the general analysis area.

Prevention of Significant Deterioration

Under requirements of the CAA, the EPA has established prevention of significant deterioration (PSD) rules, intended to prevent deterioration of air quality in attainment and unclassifiable areas. Increases in ambient concentrations of NO_2, SO_2, and PM_{10} are limited to modest increments above the existing or "baseline" air quality in most attainment areas of the country (Class II areas discussed below), and to very small incremental increases in pristine attainment areas (Class I areas discussed below).

For the purposes of PSD, the EPA has categorized each attainment area in the U.S. into one of three area classifications. PSD Class I is the most restrictive air quality category, and was created by Congress to prevent further deterioration of air quality in national and international parks, national memorial parks, and national wilderness areas of a given size threshold which were in existence prior to 1977, when the CAA was enacted, or those additional areas which have since been designated Class I under federal regulations (40 CFR 52.21). Such parks and wilderness areas are considered "mandatory" Class I areas, because they cannot be redesignated. Attainment areas defined as Class I at the request of a state or tribe (e.g., Northern Cheyenne Reservation) are considered "designated" Class I areas; this category is intended to protect air quality in areas of particular interest to the requesting entity. Because designated Class I areas are given that status by request rather than by assignment from the EPA, they can be redesignated at the option of the requesting state or tribe. For all practical purposes, however, both Class I categories are treated the same in terms of air quality and visibility impact modeling. All remaining areas outside of mandatory or designated Class I boundaries were classified as Class II areas, which allow a relatively greater deterioration of air quality over that in existence in 1977, although still within the NAAQS. No Class III areas, which would allow further degradation, have been defined.

The federal land managers have also identified certain federal assets with Class II status as "sensitive" Class II areas for which air quality and/or visibility are valued resources.

The closest mandatory Class I areas to the general analysis area are Wind Cave National Park and Badlands National Park in South Dakota, located about 123 miles east and 165 miles east-southeast of the site, respectively. The closest designated Class I area is the Northern Cheyenne Indian Reservation (in Montana), located about 74 miles from the general analysis area. The closest sensitive areas are the Class II Devils Tower National Monument and the Class II Cloud Peak Wilderness Area, which are approximately 42 and 81 miles from the general analysis area, respectively. PSD regulations limit the maximum allowable increase (increment) in ambient PM_{10} in a Class I airshed resulting from major stationary sources or major modifications to 4 $\mu g/m^3$ (annual geometric mean) and 8 $\mu g/m^3$ (24-hour average). Increases in other criteria pollutants are similarly limited. Specific types of facilities listed in the PSD rules which emit, or have the potential to emit, 100 tons per year or more of PM_{10} or other criteria air pollutants, or any other facility which emits, or has the potential to emit, 250 tons per year or more of PM_{10} or other criteria air pollutants, are considered major stationary sources and must demonstrate compliance with those incremental standards during the new source permitting process. Fugitive emissions are not counted against the PSD major source applicability threshold unless the source is so designated by federal rule (40 CFR 52.21). As a result, the surface coal mines in the PRB have not been subject to permitting under the PSD regulations because the mine emissions that are subject to PSD applicability levels fall below these thresholds.

Best Available Control Technology

All sources being permitted in Wyoming must meet state-specific BACT requirements, regardless of whether the source is subject to state/federal PSD review. During new source review, a BACT analysis is developed for the proposed project. The BACT analysis must evaluate all control options on the basis of technical, economic, and environmental feasibility. BACT for mining operations in the PRB is largely dictated by categorical control requirements defined in the WAQSR. BACT decisions are mandated through the new source review pre-construction permit.

New Source Performance Standards

The New Source Performance Standards are a program of "end-of-stack" technology-based controls/approaches required by the CAA and adopted by reference into the WAQSR. These standards, which apply to specific types of new, modified or reconstructed stationary sources, require the sources to achieve some base level of emissions control. For surface coal mining in the PRB, this includes certain activities at coal preparation plants. Specifically, the applicable requirements can be found at 40 CFR Part 60, Subpart Y (Standards of Performance for Coal Preparation Plants), and in the WAQSR. However, these standards are typically less stringent than state-level BACT limits.

Federal Operating Permit Program

The Clean Air Act Amendments require the establishment of a facility-wide permitting program for larger sources of pollution. This program, known as the Federal Operating Permit Program, or Title V, requires that major sources of air pollutants obtain a federal operating permit. Under this program, a "major source" is a facility that has the potential to emit more than 100 tons per year of any regulated pollutant, 10 tons per year of any single hazardous air pollutant, or 25 tons per year or more of any combination of hazardous air pollutants, from applicable sources. The operating permit is a compilation of all applicable air quality requirements for a facility and requires an ongoing demonstration of compliance through testing, monitoring, reporting and recordkeeping requirements. Under its proposed permit application, the Buckskin Mine's relevant potential to emit PM_{10} would be 15.8 tons per year, well below the 100 tons per year threshold. Fugitive emissions at coal mines do not contribute to the Title V applicability determination.

Summary of Pre-Construction Permitting Procedures

The WDEQ/AQD administers a permitting program to assist the agency in managing the state's air resources. Under this program, anyone planning to construct, modify, or use a facility capable of emitting designated pollutants into the atmosphere must obtain an air quality permit to construct. Coal mines fall into this category. A new coal mine, or a modification to an existing mine, must be permitted by WDEQ/AQD, pursuant to the provisions of WAQSR Chapter 6, Section 2. Under these provisions, a successful permittee must demonstrate that it will comply with all applicable aspects of the WAQSR including state and federal ambient air standards.

When a permittee decides to construct a new surface coal mine or modify operations at an existing surface coal mine that will cause an increase in pollutant emissions, they must submit an application, which is reviewed by WDEQ/AQD new source review staff and the applicable WDEQ/AQD field office. Typically, a company will meet with the WDEQ/AQD prior to submitting an application to determine issues and details that need to be included in the application. A surface coal mining application will include the standard application, BACT measures that will be implemented, an inventory of point and fugitive sources for the mine in question as well as neighboring mines and other sources, and air quality modeling analyses addressing cumulative impacts in the mining region.

The BACT must be employed at all sources permitted/exempted in Wyoming. Per WAQSR Chapter 6, Section 2, BACT at large mining operations typically include but are not be limited to: paving of access roads, treating of haul routes with chemical dust suppressant (and water), and storage of large amounts of materials/coal awaiting shipment in enclosures such as silos, troughs or barns. These and other mitigation measures are considered in the development of emission inventories used for modeling/permitting.

For the modeling analyses, an applicant must compile an emission inventory of PM_{10} from their mining operation, neighboring mines, and other surrounding sources. For PM_{10} from the applicant mine, both point source and fugitive dust emissions are quantified. The emissions are

based on the facility's potential to emit in each year of the life of the mine. The applicant also examines the surrounding coal mining operations and their most recent air quality permits to determine their emissions throughout the life of the mine. Two or more worst-case years (generally with the highest potential emissions) are then modeled in detail for ambient air quality impacts. Other surrounding emission sources may also be considered in the modeling analysis. The model years used for this analysis were 2011 and 2012. More information about modeling conducted at the Buckskin Mine and the neighboring northern group of mines is provided in attachment A to this appendix.

Long-term PM_{10} modeling is conducted for the permit application to demonstrate compliance with the annual PM_{10} standard. For the point and area sources, the Industrial Source Complex Long Term model, version 3 (ISCLT3), is typically used.

The WDEQ/AQD has recently required all mines in the PRB to "submit and justify a background PM_{10} concentration with each permit application" (WDEQ/AQD 2006). A site specific PM_{10} background concentration of 12 $\mu g/m^3$ was developed in the modeling analysis and submitted to the WDEQ/AQD for approval in March 2006, prior to submitting the Application to Modify the Buckskin Mine. With WDEQ/AQD approval, the PM_{10} modeling results were added to this background and compared to the annual standard. Likewise, compliance with the annual NO_2 standard was verified using ISCLT3 and added to the WDEQ/AQD-approved NO_2 background concentration.

Short-term PM_{10} modeling is not required by WDEQ/AQD, nor does the agency consider it to be an accurate representation of short-term impacts. Section 234 of the Clean Air Act Amendments mandates the administrator of the EPA to analyze the accuracy of short-term modeling of fugitive particulate emissions from surface coal mines. A June 26, 1996 letter from EPA Region VIII to Wyoming State Representative Ms. Barbara Cubin, details the results of an EPA study wherein the short-term model failed to meet evaluation criteria and tended to significantly overpredict 24-hour impacts of surface coal mines. The memorandum of agreement of January 24, 1994 between EPA Region VIII and the State of Wyoming allows WDEQ/AQD to conduct monitoring in lieu of short-term modeling for assessing coal mining-related impacts in the PRB. This agreement remains in effect and ambient particulate monitoring is required of each coal mine through conditions of their respective permits. The 1994 Memorandum of Agreement also requires WDEQ/AQD to implement "Best Available Work Practice" mitigation measures at any mine where an exceedance of the PM_{10} air quality standard has occurred (Federal Register: September 12, 1995,Volume 60, Number 176).

The permit application is reviewed by WDEQ/AQD to determine compliance with all applicable air quality standards and regulations. This includes review of compliance with emission limitations established by New Source Performance Standards, review of compliance with ambient standards through modeling analyses, and establishment of control measures to meet BACT requirements. The WDEQ/AQD proposed permit conditions are sent to public notice for a 30-day review period, after which a final decision on the permit is made (or a public hearing is held prior to a final permit decision).

The Buckskin Mine has prepared permit applications and conducted air quality modeling analyses (Attachment A) when mine plan changes have dictated and as required by WDEQ/AQD. These applications and analyses demonstrate that mining operations have complied, and will continue to comply, with all applicable aspects of the WAQSR and the Clean Air Act Amendments.

Coal mines in the PRB are also required to quantify nitrogen oxides (NO_x) emissions from their operations. Dispersion modeling is required to demonstrate compliance with the ambient NO_2 standard. Potential emissions from diesel powered mining equipment, blasting, and locomotive emissions (on mine property) are considered in the modeling analyses. In a fashion similar to the PM_{10} analysis, neighboring mining operations and other surrounding sources are also included in the NO_x /NO_2 analysis. Regional NO_x sources generally include power plants, natural gas compressor stations, paved highways, long-haul railroad lines, and municipalities.

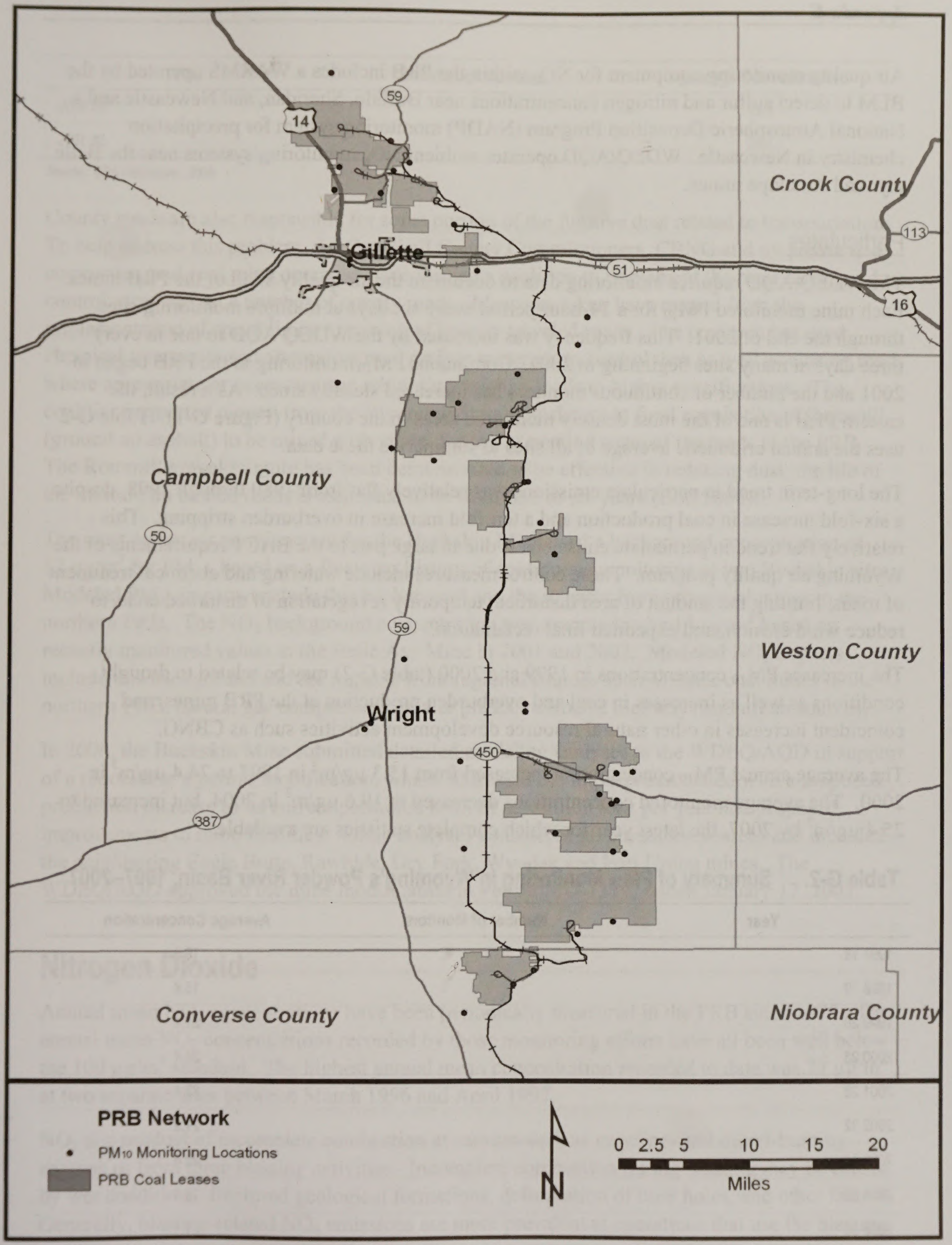
Existing Air Quality

WDEQ/AQD monitors air quality through an extensive network of air quality monitors throughout the state. The eastern portion of the PRB has an extensive network of PM_{10} monitors operated by the mining industry due to the density of coal mines in the region (Figure G-1). Monitors are also located in Sheridan, Gillette, Arvada, and Wright, Wyoming.

This network is sited to measure ambient air quality and to infer impacts from specific sources. Source-specific monitors may also be used for developing trends in PM_{10} concentrations. The WDEQ/AQD uses data from this monitoring network to identify potential air quality problems and to anticipate issues related to air quality. With this information, the WDEQ/AQD can stop or reverse trends that negatively affect the ambient air. Part of that effort has resulted in the formation of a coalition involving the counties, coal companies, and coal bed natural gas (CBNG) operators to focus on minimizing dust from roads.

The WDEQ/AQD may also take enforcement action to remedy a situation where monitoring shows a violation of any standard. If a monitored standard is exceeded at a specific source, the state agency may initiate enforcement against that source. In those instances, the state agency may use a negotiated settlement agreement to seek corrective action.

WDEQ/AQD operates two visibility monitoring stations in the PRB, both of which are Interagency Monitoring of Protected Visual Environments (IMPROVE) sites. One of these sites is located north of Gillette. This site includes a nephelometer, a transmissometer, an aerosol monitor (IMPROVE protocol), and meteorological instruments to measure wind speed, direction, temperature, and relative humidity. The site is also equipped with a digital camera and analyzers for ozone and NO_x. The second visibility monitoring station is located west of Buffalo and includes a nephelometer, a transmissometer, an aerosol monitor (IMPROVE), meteorological instruments to measure wind speed, direction, temperature, and relative humidity, plus a digital camera.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Figure G-1

Active PM_{10} Monitoring Stations in Northeastern Wyoming

Air quality monitoring equipment for NO_2 within the PRB includes a WARMS operated by the BLM to detect sulfur and nitrogen concentrations near Buffalo, Sheridan, and Newcastle and a National Atmospheric Deposition Program (NADP) monitoring system for precipitation chemistry in Newcastle. WDEQ/AQD operates ambient NO_x monitoring systems near the Belle Ayr and Antelope mines.

Particulates

The WDEQ/AQD requires monitoring data to document the air quality at all of the PRB mines. Each mine monitored PM_{10} for a 24-hour period every six days at multiple monitoring sites through the end of 2001. This frequency was increased by the WDEQ/AQD to one in every three days at many sites beginning in 2002. Continuous PM_{10} monitoring in the PRB began in 2001 and the number of continuous monitors has increased steadily since. As a result, the eastern PRB is one of the most densely monitored areas in the country (Figure G-1). Table G-2 uses the annual arithmetic average of all sites to summarize these data.

The long-term trend in particulate emissions was relatively flat from 1980 through 1998, despite a six-fold increase in coal production and a ten-fold increase in overburden stripping. This relatively flat trend in particulate emissions is due in large part to the BACT requirements of the Wyoming air quality program. These control measures include watering and chemical treatment of roads, limiting the amount of area disturbed, temporary revegetation of disturbed areas to reduce wind erosion, and expedited final reclamation.

The increases PM_{10} concentrations in 1999 and 2000 (table G-2) may be related to drought conditions as well as increases in coal and overburden production at the PRB mines, and coincident increases in other natural resource development activities such as CBNG.

The average annual PM_{10} concentration increased from 15.3 $\mu g/m^3$ in 1997 to 24.4 $\mu g/m^3$ in 2000. The average monitored concentrations decreased to 19.6 $\mu g/m^3$ in 2004, but increased to 25.4 $\mu g/m^3$ by 2007, the latest year for which complete statistics are available.

Table G-2. Summary of PM_{10} Monitoring in Wyoming's Powder River Basin, 1997–2007

Year	Number of Monitors	Average Concentration
1997	18	15.3
1998	19	15.8
1999	20	21.4
2000	23	24.4
2001	28	23.4
2002	32	21.9
2003	34	20.8
2004	36	19.6
2005	36	21.1

Year	Number of Monitors	Average Concentration
2006	36	23.9
2007	35	25.4

Source: EPA AirExplorer, 2009

County roads are also responsible for some portion of the fugitive dust related to transportation. To help address this problem, the Campbell County Commissioners, CBNG and oil production companies, and coal mine operators have formed a coalition to implement the most effective dust control measures on a number of county roads. Measures taken have ranged from the implementation of speed limits to paving of heavily traveled roads. The coalition has used chemical treatments and alternative road surface materials to control dust as well as closing roads where appropriate or necessary and rebuilding existing roads to higher specifications. The coalition requested money from the Wyoming State Legislature to fund acquisition of Rotomill (ground up asphalt) to be mixed with gravel for use in treating some of the roads in the PRB. The Rotomill/gravel mixture has been demonstrated to be effective in reducing dust; the life of the mixture on treated roads is estimated to be from five to six years (Bott 2006).

The most recent air permit action for the Buckskin Mine used a background concentration of 12 $\mu g/m^3$ for PM_{10}, based on a five-year history of continuous monitoring at two Buckskin sites. Modeled PM_{10} impacts include this background and the impacts from other coal mines in the northern PRB. The NO_2 background concentration was assumed to be 14 $\mu g/m^3$ based on recently monitored values at the Belle Ayr Mine in 2001 and 2002. Modeled NO_2 impacts include this background and the impacts from regional sources such as other coal mines in the northern PRB, natural gas compressors, power plants, railroads, highways and urban sources.

In 2006, the Buckskin Mine submitted detailed modeling analyses to the WDEQ/AQD in support of a request for a permit modification, which addressed the impacts associated with a proposed production increase to its current permitted level of 42 million tons per year and proposed improvements to mine facilities. These analyses considered all emissions sources and included the neighboring Eagle Butte, Rawhide, Dry Fork, Wyodak and Fort Union mines. The WDEQ/AQD approved the mine modification in Permit MD-1379, issued January 17, 2007.

Nitrogen Dioxide

Annual mean NO_2 concentrations have been periodically measured in the PRB since 1975. The annual mean NO_2 concentrations recorded by those monitoring efforts have all been well below the 100 $\mu g/m^3$ standard. The highest annual mean concentration recorded to date was 22 $\mu g/m^3$ at two separate sites between March 1996 and April 1997.

NO_2 is a product of incomplete combustion at sources such as gasoline- and diesel-burning engines or from mine blasting activities. Incomplete combustion during blasting may be caused by wet conditions, fractured geological formations, deformation of bore holes, and other factors. Generally, blasting-related NO_x emissions are more prevalent at operations that use the blasting

technique referred to as cast blasting (Chancellor pers. comm.). Cast blasting refers to a type of direct blasting in which the blast is designed to cast the overburden from on top of the coal into the previously mined area. The Buckskin mine does not use this technique and does not anticipate doing so in the future. The higher strip ratios at Buckskin do not lend themselves to dragline excavation, with which cast blasting is commonly associated.

Mining sources of NO_x were modeled as fugitive emissions from the areas where mining activities were projected to occur. These included overburden and coal blasting emissions, tailpipe emissions from mobile equipment, and locomotive tailpipe emissions from the Buckskin, Rawhide, Eagle Butte, Dry Fork, Fort Union and Wyodak mines. Stationary equipment tailpipe emissions from Buckskin were also modeled. NO_x emissions from blasting were estimated using emission factors provided from EPA guidance document AP-42, Section 13.3, "Explosives Detonation." EPA emission factors were also used for NO_x emissions from tailpipes and locomotives (EPA 2009).

In the mid-to late-1990s, OSM received complaints from several citizens about NO_2 emissions from blasting (particularly cast blasts) from several mines in the PRB. The EPA expressed concerns that NO_2 levels in some of those blasting clouds may have been sufficiently high at times to cause human health effects. The WDEQ/AQD also had general concerns about levels of NOx from all types of development in the PRB. In response to those concerns, the coal mining industry instituted a monitoring network in cooperation with the WDEQ/AQD to gather data on NOx emissions beginning in 2001. Additional monitoring was conducted throughout the PRB from 2003 to 2006. Coal mines in the PRB, including the Buckskin Mine, have voluntarily modified their blasting techniques; the WDEQ/AQD has imposed additional blasting restrictions at a limited number of mines (excluding Buckskin). More information about these studies and restrictions is presented in the following discussion.

On the order of the Director of the WDEQ, members of the mining industry in the PRB conducted a comprehensive, multi-year monitoring and modeling study of NO_2 exposures from blast clouds. The study was conducted at the Black Thunder Mine in the southern PRB, which is one of the largest surface coal mines in the nation. Results of the study (Thunder Basin Coal Company 2002), conducted pursuant to protocols reviewed and approved by the WDEQ/AQD, were provided to the agency and the public in July 2002.

Using a combination of NO_2 measurements collected near 91 blast sites (78 valid runs) and a conservative modeling/extrapolation approach, the authors developed a series of "safe" setback curves for coal, overburden, and cast shots for various wind speed classes. The curves were derived from the sampled data, conservative projections of concentrations at greater/lesser distances than measured, and an assumed safe level (based on a comprehensive review of available health effects data) of 5.0 parts per million for 10 minutes.

Subsequently, the data in the 2002 report were augmented with monitored data/analyses from an additional 45 validated blast events at the Eagle Butte, North Antelope Rochelle, Buckskin, and Cordero-Rojo mines. New curves were developed, based on the entire basin-wide data set,

encompassing 123 valid tests, but they differed only slightly from the original Black Thunder curves.

Other regional sources of NO_x are also modeled. These included power plants (Neil Simpson I and II, Wygen I, II, and III, Wyodak, Two Elk, and Dry Fork Station), gas compressor stations, railroads, highways and the City of Gillette. The KFx coal upgrading facility was also modeled. Emission factors and rates for these regional sources were provided by the WDEQ/AQD. Highways, railroads and urban areas were modeled as area sources, while the power plants, compressor stations and KFx were treated as point sources.

Individual and combined impacts from Buckskin, the other northern mines, and regional sources were evaluated at all model receptors. These receptors were placed around the perimeter of the North Area mines and outward in a rectangular grid with 500-meter spacing. The extent of the receptor grid was sufficient to encompass the area of significant NO_x impact from the Buckskin Mine (1.0 $\mu g/m^3$ or more). NO_2 impacts were derived by multiplying modeled NO_x concentrations by 75% (per Section 6.2.3 of EPA's Guideline on Air Quality Models, Appendix W to 40 CFR Part 51) and adding a background NO_2 concentration of 14 $\mu g/m^3$. This background was based on WDEQ/AQD guidance and ambient NO_x monitoring results at Foundation Coal's Belle Ayr Mine in 2001 and 2002.

Sources of fugitive NO_x emissions at the Buckskin Mines include overburden removal and coal blasting events, tailpipe emissions from the mining equipment, and emissions from the trains used to haul the coal from the mine. The mine does not have any point sources for NO_x.

NO_x modeling was conducted in support of the Buckskin Mining Company's June 2006 air permit application. Similar in scope to the PM_{10} analysis, emissions from Buckskin, neighboring mines and other regional sources were modeled for the two worst-case years of 2011 and 2012.

Maximum annual NO_2 impacts (including regional sources and background concentration) at any model receptor of 38.0 $\mu g/m^3$ and 37.8 $\mu g/m^3$ were predicted in 2011 and 2012 respectively, as compared to the annual NO_2 NAAQS of 100 $\mu g/m^3$. At the model receptor where these maximum values occurred, Buckskin's contributions were 1.6 $\mu g/m^3$ in 2011 and 1.8 $\mu g/m^3$ in 2012. This receptor is in an area impacted primarily by neighboring mines.

Ozone

O_3 has the same chemical structure whether it occurs miles above the earth or at ground-level and can be "good" or "bad," depending on its location in the atmosphere. In the earth's lower atmosphere, ground-level O_3 is considered "bad." Motor vehicle exhaust and industrial emissions, gasoline vapors, and chemical solvents as well as natural sources emit NO_x and VOC that help form O_3. Ground-level O_3 is the primary constituent of smog. Sunlight and hot weather cause ground-level O_3 to form in harmful concentrations in the air. As a result, it is known as a summertime air pollutant. Many urban areas tend to have high levels of "bad" O_3,

but even rural areas are also subject to increased O_3 levels because wind carries O_3 and pollutants that form it hundreds of miles away from their original sources.

Under the Clean Air Act, EPA has set protective health-based standards for O_3 in the air we breathe. Prior to May 27, 2008, the NAAQ 8-hour standard for O_3 was 0.080 parts per million (157 $\mu g/m^3$). On March 27, 2008 (effective May 27, 2008) the EPA revised the 8-hour standard to 0.075 parts per million (147 $\mu g/m^3$). Ozone monitoring is not required by the WDEQ/AQD at the Buckskin Mine but levels have been monitored at WDEQ/AQD operated and maintained ambient air quality monitor sites in the PRB since 2001. An exceedance of the O_3 8-hour standard occurs if the 4th-highest daily maximum value is above the level of the standard (0.08 parts per million prior to 2008 and 0.075 parts per million since 2008).

References

Bott, Kelly. WDEQ/AQD, Cheyenne, WY. November 28, 2006—email to Nancy Doelger, BLM, Casper, WY.

Chancellor, Rick. Wyoming Department of Environmental Quality, Cheyenne State Office, Cheyenne, WY. June 16, 2003.

McVehil-Monnett Associates (MMA). 2007. Draft Air Quality Technical Support Document (AQTSD) for the West Antelope II LBA. March. Englewood, CO

Thunder Basin Coal Company. 2002. Black Thunder Mine Report for Development of SAE Setback Distances for Blasting Activities at the Black Thunder Mine. July.

U.S. Bureau of Land Management. 1987. Data Adequacy Standards for the Powder River Coal Region. November.

U.S. Environmental Protection Agency. 2009. AP-42 Volume II, Mobile Sources, Compilation of Air Pollutant Emission Factors. Available: <http://www.epa.gov/oms/ap42.htm>.

Wyoming Department of Environmental Quality/Air Quality Division (WDEQ/AQD). 2006. PRB Coal Mine Permitting Guidance Memorandum. Available: <http://deq.state.wy.us/aqd/sec21/PRB%20Permit%20Guidance_4.pdf>. Accessed: February 24, 2007.

ATTACHMENT A – AIR QUALITY MODELING SUMMARY

for **Bureau of Land Management**

BLM Wyoming State Office
Casper Field Office
Casper, Wyoming

Air Quality Modeling Summary
Buckskin Mine Permit MD-1513

April 2009 *by IML Air Science*

555 Absaraka
Sheridan, WY 82801
(307) 674-7506



1.0 Introduction

In June 2006, IML Air Science. (IML) submitted a modeling study to the Wyoming Department of Environmental Quality, Air Quality Division (AQD) on behalf of the Buckskin Coal Company (BCC). This study was performed in support of a BCC permit application to increase annual coal production at the Buckskin Mine from 27.5 MMTPY to 42 MMTPY and to install a new truck dump, primary and secondary crusher, conveyor, transfer tower and coal silo to accommodate this increase. Based on the modeling and permit application, Permit MD-1513 was subsequently issued on January 17, 2007 by the AQD. This document summarizes the modeling process and results from that study, as referenced in the Hay Creek II Environmental Impact Study.

Since mine plan changes were necessitated by this coal production increase, the goal of this modeling study was to demonstrate that the proposed changes would not prevent the attainment or maintenance of the PM_{10} and NO_2 air quality standards in Wyoming. To that end, air quality modeling in Wyoming consists of the following steps:

- Development of an updated mine plan to account for the coal production increase
- Generating an updated list of equipment required to achieve the production increase
- Determination of "open acreage" requirements
- Determination of BACT for qualifying fugitive and point sources
- Determination of miscellaneous emission control practices
- Development of emission inventories and "worst-case" year determination
- Determination of background PM_{10} and NO_2 concentrations
- Model selection, execution and results

The following sections describe this process for the Buckskin Mine in greater detail.

2.1 Mine Plan

BCC's Buckskin Mine is an existing multiple-pit surface coal mine that utilizes traditional truck and shovel techniques to mine coal. To account for the proposed production increase, BCC developed an updated topsoil stripping, coal mining and reclamation sequence, which would allow for coal extraction at the Buckskin Mine through the year 2018. This mine plan was finalized and subsequently submitted to IML for use in the model.

2.2 Mine Equipment List

BCC developed an inventory of mine equipment required to attain the proposed production increase. This inventory varies from year to year depending on haul distance, overburden thickness, and other factors. The percentage of larger equipment generally increases through time as older, smaller equipment is retired. Accompanying the production increase, BCC was to install a second truck dump, primary crusher, conveyor system, secondary crusher, and transfer tower, along with an additional coal storage silo. This information was submitted to IML for use in the model.

2.3 Open Acreage

Permitting requirements established by AQD in 2002 include a discussion of open acreage potentially subject to wind erosion. More specifically, the requirement is to discuss, summarize, and map the land status for the current year and for the years modeled. This is similar to a Wyoming Department of Environmental Quality, Land Quality Division (LQD) annual report requirement. Some of the information used in the model was obtained from the annual report to LQD for the 2005 reporting year, which represented the "current year" for the application.

BCC projected the amount of open acreage for the modeled years of 2011 and 2012, based on the current open acreage and the revised topsoil stripping and reclamation sequence. These figures provided the "disturbed acres" subject to wind erosion in each of the modeled years' emission inventories.

2.4 BACT

For this modeling study, a Best Available Control Technology (BACT) analysis was performed by IML to take into account control measures, such as chemical applications to roads, enclosing silos, bins and other storage areas and treatment of active work areas. These active work areas include those for scrapers, blasting, overburden/coal loading areas, coal dumping, haul road repair and areas susceptible to wind erosion. Once these control measures were determined, they were used in the development of the emission inventory.

2.5 Miscellaneous Emission Control Practices

Other control practices contained in the emission inventory include a coal fire mitigation program and a haul road dust suppression program. Both of these programs act to minimize fugitive emissions at the mine.

2.6 Emission Inventory Development and Worst-Case Year Selection

Fugitive and point source emission inventories for PM_{10} and NO_x were developed for the Buckskin Mine based on site-specific information provided by the mine. Fugitive and point source emissions for PM_{10} and NO_x from nearby mines (Rawhide, Eagle Butte, Dry Fork, Wyodak and Fort Union Mines) were also developed from current permit information. The resultant particulate emission inventories were used to determine the years that would be modeled.

Projections of future mine-wide emissions from Buckskin and other regional sources were based on methodologies prescribed by the AQD. Specifically, those methodologies were discussed with AQD staff in a pre-application conference on December 20, 2005. Subsequently, it was decided to use the most recent Memorandum, *PRB Coal Mine Permitting Guidance*, issued by WDEQ-AQD on February 27, 2006 (WDEQ-AQD, 2006a). This memo forms the primary basis for how the permitting analysis was performed. To supplement mine emission sources in the regional NO_x modeling, AQD provided an updated inventory of NO_X emissions from regional sources. These sources included coal bed methane (CBM) compressor stations, power plants, railroads, highways and urban sources.

2.6.1 Fugitive and Point Source PM_{10} Emission Inventory

BCC provided life-of-mine (LOM) coal production, overburden handling and related operational parameters needed for emission inventory development for the 42 MMTPY mine plan evaluated for this study. The parameters were used in conjunction with a set of emission factors endorsed by the AQD (WDEQ-AQD, 1979) and EPA's AP-42 to calculate annual emissions of PM_{10} and NO_x from each emission-producing activity. Note that the AQD emission factors calculate TSP

emissions, which are then multiplied by AQD's factor of 0.30 to arrive at the PM_{10} emission factors.

The Buckskin coal preparation and processing facilities include crushers, material transfers and loadouts. All existing point sources at the coal preparation facilities are outfitted with either baghouses or Passive Enclosure Systems (PECS). The PECS eliminate the points' potential to emit fugitive emissions. Such controls are deemed by WDEQ-AQD to be zero emitters.

2.6.2 Mobile and Stationary Source PM_{10} Emission Inventory

Mobile PM_{10} emission sources at the Buckskin Mine include scrapers, haul trucks, graders, dozers, water trucks, support vehicles, locomotives, drills and loaders. Emissions were calculated using AQD emission factors for all sources except locomotives, where the exhaust emission factor was calculated from EPA's AP-42 mobile source guidance.

PM_{10} emissions from stationary diesel engines were calculated using operating hours from calendar year 2005 as a baseline, with appropriate increases to reflect a maximum coal production level of 42 million tons per year. These engines include light plants, compressors, pumps, welders and generators.

2.6.2 Mobile and Fugitive Source NO_x Emission Inventory

Emission sources included in this inventory are the exhaust from mobile source mining equipment such as scrapers, haul trucks, graders, dozers, water trucks and locomotives, and fugitive sources such as overburden and coal blasting events. Mobile source (tailpipe) NO_x emissions were calculated using estimated operating hours necessary to mine coal at the future projected production rate and EPA approved mobile source emission factors. NO_x emissions from blasting were calculated using estimated explosive usage necessary to mine coal at the future projected rate and an EPA approved emission factor.

2.6.2 Stationary Engine NO_x Emission Inventory

NO_x emissions from stationary engines were calculated using actual operating hours from calendar year 2005 as a baseline, with appropriate increases to reflect a maximum coal

production level of 42 million tons per year. The emission factor for stationary engines came from EPA's AP-42.

2.7 Regional Source Emission Inventories

The following neighboring mines in the Nouth Group were included in the PM_{10} modeling analysis: Eagle Butte, Rawhide, Dry Fork, Wyodak and Fort Union. These mines, plus regional sources provided by AQD (regional power plants and point sources, CBM sources, mainline trains, urban areas, and road emissions), were considered in the NO_x analysis. All regional NO_x sources and emissions were obtained in accordance with methodologies approved by AQD.

2.7.1 Railroad, Road, Power Plant, Urban, Coal Bed Methane and Regional Point Sources

The information for railroads, highways, power plants, urban areas, and regional point sources was provided by AQD on May 5, 2005. These sources generally fell within a 40 km by 60 km screening area prescribed by AQD for the regional NO_x analysis. Power plants included Two Elk Power Plant (slightly outside the screening area), Neil Simpson I and II Power Plants, Wyodak Power Plant, WYGEN Unit I Power Plant and two power plants with air quality permit applications under review by AQD at the time of Buckskin's submittal. These two, the Dry Fork Station and WYGEN Unit II were included at the advice of AQD. The sole urban source included in the modeling analysis was the town of Gillette. The KFx coal upgrading facility was also included in the analysis. Other point sources included compressor stations supporting oil/gas/CBM activities. Only NO_x emissions were considered from these sources and no scale-up factors were used at the instructions of AQD.

2.8 Selection of Worst-Case Years

AQD policy requires that the maximum PM_{10} and NO_x impacts (during the life-of-mine) from all mine sources be identified and compared to the applicable air quality standards. Because it is not practical to model all of the years in the life-of-mine, years with maximum annual emissions from mining operations are determined and then modeled. Model results for these "worst-case" emission years are then compared to the applicable ambient air quality standards. If the

maximum impact is below the air quality standard, it can be assumed that the standard will be achieved throughout the LOM.

Based on Buckskin Mine and regional emission inventories, LOM years 2011 and 2012 were chosen as worst-cases to be modeled. Year 2012 was selected primarily because it represents the highest annual PM_{10} emission year for the Buckskin Mine (1,180 tons/year); 2011 represents the highest annual PM_{10} emissions for all North Group mines combined.

These model years are also among the worst-case for Buckskin NO_x emissions, with 2012 having the highest annual emissions (1,689 tons/year), and 2011 having the third highest annual emissions (1,625 tons/year). Year 2011 also has the highest NO_x emission total for the North Group mines. Therefore, the selection of these worst-case years will also provide the maximum potential NO_x impacts on the Nouth Group modeling area.

2.9 Dispersion Modeling Methodology

Cumulative PM_{10} impacts from Buckskin Mine and neighboring mines were modeled using the Industrial Source Complex Long-Term (ISCLT3) Model. PM_{10} impacts were modeled for all facilities for the two worst-case years, and concentrations were calculated at receptors located along the Lands Necessary to Conduct Mining (LNCM) boundaries for the North Group mines. The cumulative PM_{10} concentrations at each receptor location were compared to the Wyoming and Federal annual ambient air quality standard of 50 $\mu g/m^3$ to determine compliance with that standard.

NO_2 impacts from Buckskin and neighboring sources were also modeled for the two worst-case years. However, an initial model run was first performed for each worst-case year to determine the significant impact area ($\geq$ 1$\mu g/m^3$ annual average NO_x impact) produced on a regional receptor grid from sources within the Buckskin Mine only. Then, additional model runs for each worst-case year considered all sources from the area mines, as well as the regional sources, to determine cumulative NO_2 impacts at receptors within the significant impact area. The cumulative NO_2 concentrations were compared to the Wyoming and Federal ambient air quality standard of 100 $\mu g/m^3$ to determine compliance. Emissions were modeled as NO_x, and the final

concentrations were multiplied by 0.75 to account for chemical conversion to NO_2. The 0.75 factor is in accordance with Section 6.2.3 of EPA's Guideline on Air Quality Models (40 CFR Part 51, Appendix W).

2.9.1 Dispersion Model

The Industrial Source Complex Long-Term (ISCLT3) Model was used to model annual average PM_{10} and NO_2 concentrations from both fugitive emission sources and point sources per AQD directive (WDEQ-AQD, 2006a). The latest version of ISCLT3 was downloaded from EPA's Support Center for Regulatory Models. The number of sources and receptors was expanded to 2,000 and 10,000 respectively, and the model was recompiled. ISCLT3 was run in regulatory default mode with rural dispersion parameters. In addition, the model was run using elevations for all point sources and receptors. Elevations were determined from USGS 7.5-minute digital elevation models (DEM's).

2.9.2 Terrain Data

The DEM's, all source locations, and receptor locations for each worst-case year were used as inputs into the EPA's terrain processor, AERMAP. AERMAP uses the input data to extract elevations in meters for all sources and receptors. These elevations were then used in each respective ISCLT3 input file.

2.9.3 Meteorological Data

Hourly on-site meteorological data collected at the Eagle Butte Mine were used in this modeling analysis. AQD provided IML with the Eagle Butte six-year (1995 – 2000) Joint Frequency Distribution (JFD) of wind speed, wind direction, and atmospheric stability class. Annual average temperatures were taken from values recorded from 1925 to 2001 at the Gillette National Weather Service meteorological station. Atmospheric mixing heights were provided by AQD.

2.9.4 Receptors

For PM_{10} modeling, receptors were placed along the LNCM boundaries for the Buckskin, Dry Fork, Eagle Butte, Rawhide, Fort Union and Wyodak Mines with a spacing of 500 meters. The AQD "Mine A/Mine B" policy for cumulative impacts applied to this analysis because the

Rawhide and Buckskin mines have LNCM boundaries that overlap. Receptors were placed on these overlapping LNCM boundaries to model the impact of Buckskin PM_{10} emissions on Rawhide Mine's overlapping boundary. Following the WDEQ-AQD Mine A/Mine B policy, the receptors from overlapping boundaries were not included in the top ten receptor concentrations.

Compliance and significant impact receptor networks were created for the NOx modeling analysis. The significant impact receptor network comprised a rectangular grid 33 by 54 kilometers on 500-meter spacing. This proved sufficiently large to encompass modeled significant impacts (greater than or equal to 1 $\mu g/m^3$) from Buckskin Mine for years 2011 and 2012. The NO_2 compliance receptor network included the North Group Mine LNCM boundary receptors in addition to a rectangular grid receptor network fully containing the Buckskin-related NO_x significant impact isopleths (1 μg/m3) for years 2011 and 2012. This network extended 28 km in the east-west direction and 50 km in the north-south direction. All NO_2 modeling receptors were spaced at 500-meter intervals.

2.9.5 Emission Apportioning

Fugitive PM_{10} and NO_x emissions for each of the worst-case years were apportioned into area sources based on the activity type and location. The number and location of the area sources, as well as their dimensions and orientation, were based on the pit configuration and road orientation provided in the mining progression map. Emissions were divided by the area of each area source in which they occurred to arrive at an emission rate in grams/second/square meter. NO_x emissions for the regional roads and mainline trains were also apportioned into area sources.

2.9.6 Point Source Modeling Parameters

Prior to this permit application, Buckskin Mine reduced the number of point sources of PM_{10} emissions by converting all but four baghouses at their coal preparation facilities to PECS. PECS is considered a zero emission technologyl, effectively eliminating emissions from all but four point sources at Buckskin. Point source parameters from North Group mines were used in the model as identified in each mine's most recent permit.

2.9.7 PM_{10} and NO_2 Background Concentration

For both PM_{10} and NO_2, background concentrations were added to the predicted annual average concentrations at each model receptor to yield total ambient concentrations. The levels of these background concentrations were developed in consultation with the Air Quality Division. The AQD has required all mines in the PRB to "submit and justify a background PM_{10} concentration with each permit application" (WDEQ-AQD, 2006a). Buckskin Mine submitted such an analysis to the AQD on March 20, 2006. Hourly data from the Buckskin meteorological station and two continuous particulate monitoring stations were studied to determine PM_{10} concentrations in ambient air not impacted by the Buckskin mining operation. Four years worth of data were used (2002 through 2005). Approximately 60,000 hourly average PM_{10} concentrations were compiled and correlated with wind directions spanning the southwest and northwest quadrants, the most likely sources of background air. As expected, each of the two particulate monitors demonstrated minimum ambient PM_{10} concentrations during periods when the wind was blowing toward the center of Buckskin mining activity. The study produced a site-specific PM_{10} background concentration of 12 $\mu g/m^3$. This level was approved by the AQD prior to submittal of the permit Application in June, 2006.

A background nitrogen dioxide (NO_2) concentration of 14 µg/m3 was obtained through ambient monitoring conducted in 2001 and 2002 at the Foundation Coal Belle Ayr Mine. The NO_2 background concentration has been revised from the previous value of 20 $\mu g/m^3$, which was obtained from pre-construction monitoring conducted for the 1978-79 Wyodak project. The AQD considers the more recent Belle Ayr Mine NO_2 data to be a more accurate representation of background NO_2 concentrations due to the larger amount of data collected and tighter quality assurance procedures placed on that data. The background value of 14 $\mu g/m^3$ represented the highest annual average (from Belle Ayr Mine in both 2001 and 2002) taken from the four NO_2 monitors located in the area of coal bed methane activity.

2.10 Modeling Results

2.10.1 PM_{10} Modeling Analysis and Results

The PM_{10} area source and point source characteristics for Buckskin Mine and the North Group mines were input into ISCLT3 for each worst-case year. The LNCM receptors and local meteorological parameters were also input to the model. The site-specific background

concentration of 12 $\mu g/m^3$ was added to the results from the model to obtain the total impact from the fugitive and point sources.

All model results from the Buckskin Mine impact analysis show concentrations, after adding background, below the Federal and Wyoming annual PM_{10} air quality standard of 50 $\mu g/m^3$. The maximum cumulative concentration predicted in 2011 was 40.3 $\mu g/m^3$ (including 12.0 $\mu g/m^3$ background) and occurred along the Eagle Butte LNCM. For year 2012, the maximum predicted cumulative concentration of 40.6 $\mu g/m^3$ (including background) also occurred along the Eagle Butte LNCM. Note that in 2012 sources within the Buckskin Mine contributed only 0.59 $\mu g/m^3$ to this maximum cumulative concentration.

2.10.2 NO_2 Modeling Analysis and Results

Buckskin mine emission sources were modeled for each worst-case year in order to determine the extent of the annual average 1 $\mu g/m^3$ contour defining the significant impact area. Receptors within the significant impact areas were then modeled to determine compliance with the ambient air standard in the cumulative impact modeling assessment, as discussed below.

The area source and point source NO_x information for Buckskin and other North Group mines were input into ISCLT3 for each worst-case year along with the significant impact area receptor grid and JFD. Annual NO_x emissions from other regional sources were also input into the model. Emissions were modeled as NO_x, with the resulting concentrations multiplied by 0.75 to account for chemical conversion to NO_2. The AQD-specified background concentration of 14 $\mu g/m^3$ NO_2 was then added to the model results to obtain the total impact.

The Wyoming and Federal annual NO_2 air quality standard, to which the model results are compared, is 100 $\mu g/m^3$. All model results for the Buckskin impact analysis show concentration predictions well below this value.

The maximum cumulative concentration predicted in 2011 was 38.0 $\mu g/m^3$ (including background) and occurred along the Eagle Butte boundary. Buckskin's contribution to this highest concentration was 1.61 $\mu g/m^3$. For 2012, the maximum predicted cumulative

concentration was 37.8 μg/m^3 (including background) and also occurred along the Eagle Butte LNCM boundary. Buckskin's contribution to this highest concentration was 1.79 μg/m^3.

2.10.3 Short-term Particulates

AQD does not require modeling of fugitive dust emissions to predict compliance with the 24-hour PM_{10} standard (which is 150 μg/m^3, not to be exceeded more than one time per year). Neither EPA nor the AQD have been able to demonstrate that available modeling tools and emission factors are adequate for this task. Section 234 of the 1990 Clean Air Act Amendments required EPA to demonstrate that it had adequate modeling tools before the agency could require states to employ 24-hour modeling at surface coal mines. To date, that demonstration has not been made.

Instead, it has been AQD's position that ambient air monitoring data collected by the mines demonstrate that compliance with short-term ambient standards can be achieved when a mine employs BACT. A memorandum of agreement dated January 24, 1994 between EPA and the state of Wyoming allows AQD to use particulate monitoring in lieu of short-term modeling to assess 24-hour compliance and to predict short-term ambient impacts from mining. In 2002 AQD also began requiring a demonstration that "…mining operations will not cause or contribute to ambient violations…" (WDEQ-AQD, 2006a). The following discussion is a demonstration that Buckskin will not cause or contribute to a 24-hour PM_{10} ambient air violation in the area of the North Group.

2.10.4.1 Historical Ambient Air Quality

2.10.4.2 Buckskin Mine

Ambient PM_{10} concentrations are monitored at two locations at the Buckskin Mine. These locations are identified as the West Teom and North Teom sites. Each site is equipped with a low-volume Rupprecht & Patashnick Tapered Element Oscillating Microbalance (TEOM) PM_{10} continuous monitor. The monitors meet the US EPA Automated Equivalency Method (EQSA-0495-100). The particulate and meteorological monitoring network is operated in accordance with Buckskin Mine Quality Assurance Project Plan (QAPP) approved in August 2008. Both monitors record hourly average and 24-hour average PM_{10} concentrations, with the latter being

reported to AQD quarterly. The highest yearly second-high 24-hour PM_{10} concentration at the Buckskin Mine was 139 $\mu g/m^3$, which occurred at the West Teom site in 2003.

While none of the annual second-high PM_{10} concentrations at the Buckskin Mine has ever been over the 24-hour standard of 150 $\mu g/m^3$, during the last six years three of the monitored first-high concentrations have exceeded this 24-hour standard. The first exceedance occurred at the North Teom site on August 16, 2002 and resulted in a maximum 24-hr PM_{10} concentration of 181.7 $\mu g/m^3$. This exceedance correlated with strong winds and was judged an "exceptional event" by the AQD. A second exceedance occurred at the West Teom site on December 27, 2003 and resulted in a maximum 24-hr concentration of 202.4 $\mu g/m^3$. The third exceedance occurred at the West Teom site on March 27, 2007, resulting in a maximum 24-hr concentration of 244.0 $\mu g/m^3$. WDEQ-AQD deemed the 2007 exceedance an "exceptional event," as provided for by the recently implemented Natural Events Action Policy (NEAP). Winds on that day averaged over 33 mph with a peak hourly average of 42 mph. Buckskin followed all mitigation and documentation procedures as required by the NEAP. In all three cases detailed reports of the exceedance and accompanying meteorological conditions were submitted to WDEQ-AQD.

2.10.4.3 North Group Mines (Rawhide, Eagle Butte, Dry Fork Wyodak and Fort Union)

The northern mines consist of five mines in addition to Buckskin: Dry Fork Mine, Eagle Butte Mine, Fort Union Mine, Rawhide Mine, and Wyodak Mine. All of the mines, with the exception of Fort Union, operate in accordance with a Quality Assurance Project Plan specific to each mine. The Fort Union mine has not been in operation for the last several years. Besides Buckskin, the four other active mines in the North Group currently operate a total of 9 PM_{10} monitors. Among these mines the 24-hr PM_{10} NAAQS of 150 $\mu g/m^3$ was exceeded three times. The Wyodak mine recorded a value of 165 $\mu g/m^3$ in 2005. In 2007 the Rawhide and Eagle Butte mines recorded 178 $\mu g/m^3$ and 168 $\mu g/m^3$ respectively. All three values were deemed "Exceptional Events" by WDEQ, due to high winds.

2.10.4.4 Compliance Demonstration

Under the revised mining operation modeled in this application, the Buckskin Mine will not

cause or contribute to a violation of the 24-hour ambient air standard. The following points form the reasoning for this conclusion.

- By virtue of monitored concentrations collected at the Buckskin Mine over the past three years, it is clear that mining activities at the Buckskin Mine do not cause or significantly contribute to violations of the 24-hour ambient air standard. The maximum highest second-high 24-hour PM_{10} concentration monitored at the Buckskin Mine during the past three years was below the standard at 107 $\mu g/m^3$, and the average of the highest second-high concentrations was 75 $\mu g/m^3$. The maximum first-high concentration in 2007 did exceed the standard, but was deemed the result of extremely high winds.
- The replacement of baghouse controls with zero-emission PECS on all but four of the point sources will reduce dust emissions at Buckskin Mine. This will have a beneficial effect on air quality and monitored concentrations.
- Modeling results indicate that it is unlikely that the Buckskin Mine will contribute in the future to a violation of the annual PM_{10}.standard of 50 $\mu g/m^3$. As discussed above, the highest modeled annual concentrations at any of the North Group receptors in 2011 and 2012 were 40.3 and 40.6 $\mu g/m^3$ respectively. For both years, Buckskin's contribution to the highest modeled average concentrations was less than the significant impact threshold of 1 $\mu g/m^3$.
- During the times when mining emissions from the Buckskin Mine blow towards neighboring mines, it is unlikely that such emissions will contribute to a violation because of the nature of the emissions released and the distance that they must travel before impacting an air monitor. Mining emissions are typically low-level releases consisting of particulate matter that is subject to gravitational settling. Emissions from current Buckskin mining operations would have to travel several miles before reaching Rawhide Mine, which is the closest mine to Buckskin. Particulate settling over these distances will minimize possible contributions to violations.

REFERENCES

WDEQ-AQD, 2006a, (2/27/06) Memorandum From Bernie Dailey to Powder River Basin Coal Mine Operators. *PRB Coal Mine Permitting Guidance.*

WDEQ-AQD, 1979, Memorandum from Charles Collins. (Wyoming) *Fugitive Dust Emission Factors.*

APPENDIX H

NON-MINE GROUNDWATER AND SURFACE WATER RIGHTS

APPENDIX H: NON-MINE GROUNDWATER AND SURFACE WATER RIGHTS

Table H-1. Groundwater Rights[1] within 3 Miles of the General Analysis Area

Appropriation	T	R	S	QQ	Permit Uses	Permit Facility Name	Permit Applicant	TD	SWL
P78393W 53		72	27	SWSW	STO	JOHN #11	GILBERT OEDEKOVEN	240	180
P4045P	53	72	27	SESW	DOM,STO	HAMPE #2	RENE A. HAMPE	3	0
P86156W 53		72	27	SESW	DOM	HAMPE #1	RENE A. HAMPE	420	235
P4044P	53	72	27	SESW	DOM,STO	HAMPE #1	RENE A. HAMPE	6	0
P115507W 53		72	29	SWSW	STO	STEINER NORTH SPRING	BYRON F/MARJORIE OEDEKOVEN	15	0
P111696W 53		72	30	SWSW	STO,CBNG Lynde	14C-3032	DEVON ENERGY PRODUCTION CO. L.P.	299	110
P115508W 53		72	31	NWNE	STO	STEINER NW #2E	BYRON F/MARJORIE OEDEKOVEN	210	46
P115517W 53		72	31	NENW	DOM,STO	HOUSE WELL #1	RICHARD M/OR JUDY K LYNDE	360	200
P130428W	53	72	31	SWSE	STO	LANDECK # 8	WILLIAM A. LANDECK	564	260
P77546W	53	72	31	SWSE	STO	LANDECK #12	FRANK LANDECK	280	80
P18184P 53		72	32	SENE	DOM,STO	JOHN #3	GILBERT OEDEKOVEN	220	120
P115506W	53	72	32	SESW	STO	STEINER HAND DUG	BYRON F/MARJORIE OEDEKOVEN	40	35
P115505W	53	72	32	SESW	STO	STEINER YARD #1E BYRON	F/MARJORIE OEDEKOVEN	125	65
P115509W	53	72	32	SESW	STO	STEINER YARD #1W BYRON	F/MARJORIE OEDEKOVEN	65	35
P111927W	53	72	32	SESW	DOM	Oedekoven House Well #1	BYRON F OEDEKOVEN		
P18188P	53	72	32	SWSE	STO	JOHN #7	GILBERT OEDEKOVEN	150	80
P18185P 53		72	33	NENW	STO	JOHN #4	GILBERT OEDEKOVEN	180	90
P27251W 53		72	33	SWNW	DOM,STO	JOHN #8	GILBERT OEDEKOVEN	315	34
P61232W 53		72	33	SWNW	DOM,STO	JOHN #9	GILBERT OEDEKOVEN	800	320
P110932W	53	73	25	SESW	STO, CBNG	Hall Fed 24C-2533	REDSTONE RESOURCES, INC.	368	161
P177784W	53	73	25	SESW	STO,CBNG	HALL FEDERAL 24C-2533	DEVON ENERGY PRODUCTION CO. L.P.	367	312

Appropriation	T	R	S	QQ	Permit Uses	Permit Facility Name	Permit Applicant	TD	SWL
P115195W	53	73	25	SWSE	STO,CBNG	LYNDE 34C-2533	DEVON ENERGY PRODUCTION CO. L.P.	416	172
P107671W	53	73	25	SESE	STO,CBNG	LYNDE 44C-2533	DEVON ENERGY PRODUCTION CO. L.P.	341.5	110
P52285W	53	73	25	SESE	STO	BAM 30	RICHARD M/OR JUDY K LYNDE	330	95
P115518W	53	73	25	SESE	STO	WEST PASTURE WELL #1	RICHARD M/OR JUDY K LYNDE	254	110
P110637W	53	73	34	SESE	STO,CBNG	LANDECK 44C-3433	DEVON ENERGY PRODUCTION COMPANY, L.P	795	251
P177793W	53	73	35	SENW	STO,CBNG	HALL FEDERAL 22C-3533	DEVON ENERGY PRODUCTION CO. L.P.	452	196
P110955W	53	73	35	SENW	STO,CBNG	Hall Fed 22C-3533	REDSTONE RESOURCES, INC.	452	196
P110638W	53	73	35	NWSW	STO,CBNG	HALL 13C-3533	REDSTONE RESOURCES, INC.	522	160
P36325W	53	73	35	NWSW	MON	A35 3	GULF MINERAL RESOURCES COMPANY	535	4.6
P177790W	53	73	35	NWSW	STO,CBNG	HALL 13C-3533	DEVON ENERGY PRODUCTION CO. L.P.	522	160
P140606W	53	73	35	SWSW	CBNG	HALL 14W-3533	DEVON ENERGY PRODUCTION CO. L.P.	806	746
P135554W	53	73	35	SWSW	CBNG	HALL 14A-3533	DEVON ENERGY PRODUCTION CO. L.P.	179	170
P177787W	53	73	35	SESW	STO,CBNG	HALL FEDERAL 24C-3533	DEVON ENERGY PRODUCTION CO. L.P.		
P110919W	53	73	35	SESW	STO,CBNG	Hall Fed 24C-3533	Redstone Resources	464	171
P26475W	53	73	35	NESE	MIS	HALL #4	MEADOWLARK FARMS INC.**JOY LUCILLE HALL	660	200
P177792W	53	73	35	NWSE	STO,CBNG	HALL FEDERAL 33C-3533	DEVON ENERGY PRODUCTION CO. L.P.	404	141
P110956W	53	73	35	NWSE	STO,CBNG	Hall Fed 33C-3533	REDSTONE RESOURCES INC.	404	141
P114994W	53	73	35	SESE	STO,CBNG	HALL 44C-3533	DEVON ENERGY PRODUCTION CO. L.P.	389	132
P111707W	53	73	36	NWNE	STO,CBNG	State 31C-3633	WY STATE BOARD OF LAND COMMISSIONERS** DEVON ENERGY PRODUCTION CO. L.P.	305 105	
P111709W	53	73	36	SENE	STO,CBNG	State 42C-3633	WY STATE BOARD OF LAND COMMISSIONERS** DEVON ENERGY PRODUCTION CO. L.P.	303 128	
P111703W	53	73	36	NWNW	STO,CBNG	State 11C-3633	WY STATE BOARD OF LAND COMMISSIONERS** DEVON ENERGY PRODUCTION CO. L.P.	332 60	

Appropriation	T	R	S	QQ	Permit Uses	Permit Facility Name	Permit Applicant	TD	SWL
P111705W 53		73	36	SENW	STO,CBNG	State 22C-3633	WY STATE BOARD OF LAND COMMISSIONERS** DEVON ENERGY PRODUCTION CO. L.P.	406 203	
P111704W	53	73	36	NWSW	STO,CBNG	State 13C-3633	WY STATE BOARD OF LAND COMMISSIONERS** DEVON ENERGY PRODUCTION CO. L.P.	377 79	
P3262P	53	73	36	SWSW	STO	#5 HALL	DEAN W. HALL** STATE OF WYOMING	110	70
P111706W	53	73	36	SESW	STO,CBNG	State 24C-3633	WY STATE BOARD OF LAND COMMISSIONERS** DEVON ENERGY PRODUCTION CO. L.P.	411 188	
P111708W	53	73	36	NWSE	STO,CBNG	State 33C-3633	WYO BOARD OF LAND COMMISSIONERS** REDSTONE RESOURCES, INC.	385 202	
P111701W	53	73	36	SWSE	STO,CBNG	REILE 34LC-3333	DEVON ENERGY PRODUCTION CO. L.P.	468	217
P111687W 53		73	36	SESE	STO,CBNG	State 44C-3633	REDSTONE RESOURCES, INC.	358	198
P25G 52		72	2	NWNE	IND	ADON WATER WELL #1	TEXAS CO.	567	445
P15391W	52	72	3	SWNE	STO	HOLLER #1	D. C. HOLLER		
P18187P 52		72	5	NENE	STO	JOHN #6	GILBERT OEDEKOVEN	140	60
P42484W 52		72	5	NENW	STO	JOHN #10	GILBERT OEDEKOVEN	225	120
P123569W	52	72	6	SWNE	STO,CBNG	Landeck 32C-622	REDSTONE RESOURCES INC.	252	132
P26477W	52	72	6	SWNW	MIS	HALL #6	MEADOWLARK FARMS INC.**JOY LUCILLE HALL	400	140
P109849W 52		72	6	SWNW	STO,CBNG	HALL 12C-622	REDSTONE RESOURCES, INC.	377	189
P109850W 52		72	6	NESW	STO,CBNG	FRANKLIN 23C-622	REDSTONE RESOURCES, INC.	295	143
P106925W 52		72	6	NWSW	STO,MIS,CBNG	HALL 13C-622	REDSTONE RESOURCES, INC	343	172
P110963W	52	72	6	SWSW	STO,CBNG	Franklin 14C-622	REDSTONE RESOURCES, INC.	437	264
P108735W 52		72	6	SESW	STO,CBNG	FRANKLIN 24C-622	REDSTONE RESOURCES, INC	339	163
P113421W 52		72	6	NESE	STO,CBNG	FRANKLIN 43C-622	REDSTONE RESOURCES, INC.	296	270
P110630W 52		72	6	NWSE	STO,CBNG	FRANKLIN 33C-622	REDSTONE RESOURCES, INC.	333	203
P111689W 52		72	6	SWSE	STO,MIS,CBNG	Franklin 34C-622	REDSTONE RESOURCES, INC.	326	224

Appropriation	T	R	S	QQ	Permit Uses	Permit Facility Name	Permit Applicant	TD	SWL
P115198W 52		72	6	SESE	STO,CBNG	FRANKLIN 44C-622	REDSTONE RESOURCES, INC.	317	292
P177473W 52		72	6	SESE	STO	FOWLSTON STOCK #1	BYRON F/MARJORIE OEDEKOVEN		
P111690W 52		72	7	NENE	STO,MIS,CBNG	Franklin 41C-722	REDSTONE RESOURCES, INC.	261.5	134
P111691W 52		72	7	SENE	STO,CBNG	Franklin 41C-722	REDSTONE RESOURCES, INC.	284	173
P120886W 52		72	7	NENW	STO,CBNG	Oedekoven 21C-722	Redstone Resources	370	347
P107778W 52		72	7	NWNW	STO,MIS,CBNG	OEDEKOVEN 11C-722	REDSTONE RESOURCES, INC	361	154
P107776W 52		72	7	SENW	STO,CBNG	OEDEKOVEN 22C-722	REDSTONE RESOURCES, INC	365	201
P107777W 52		72	7	NWSW	STO,MIS,CBNG	OEDEKOVEN 13C-722	REDSTONE RESOURCES, INC	299	127
P114989W 52		72	7	SWSW	STO,CBNG	FRANKLIN 14C-722	REDSTONE RESOURCES, INC.	273	213
P108734W 52		72	7	SESW	STO,CBNG	FRANKLIN 24C-722	REDSTONE RESOURCES, INC	265	75
P110631W 52		72	7	NWSE	STO,MIS,CBNG	OEDEKOVEN 33C-722	REDSTONE RESOURCES, INC.	326	162
P115510W	52	72	7	SWSE	STO	PERRY W #1E	BYRON F/MARJORIE OEDEKOVEN 300		75
P115511W	52	72	7	SESE	STO	PERRY E #1W	BYRON F/MARJORIE OEDEKOVEN	42.1	25.1
P119224W 52		72	8	NENW	STO,CBNG	Taylor 21C-822	REDSTONE RESOURCES, INC.	339	280
P119414W	52	72	8	SWNW	STO,CBNG	Taylor 12C-822	Redstone Resources	256	161
P161015W 52		72	8	NESE	CBNG	HALL 43C-822	MAJESTIC PETROLEUM OPERATIONS, LLC	198	115
P103907W 52		72	9	SWNW	STO	912C-C5	CARL/OLA MCGEE	220	84.7
P58643W 52		72	9	NESW	MON	09/11/2005	WY BOARD OF LAND COMMISSIONERS** SHELL OIL COMPANY		
P63080W 52		72	9	NWSW	MON	9-12C-C5(1)	WY BOARD OF LAND COMMISSIONERS**MINING SHELL OIL COMPANY	80 -1	
P3186P 52		72	12	NWSW	STO	60 BAR 2	60 BAR RANCH	72	50
P20030P	52	72	13	NWNW	DOM,STO	OFFUTT #1	PAUL AND JANE ROURKE	240	70
P20031P 52		72	14	NWNE	STO	ROURKE #1	PAUL AND JANE ROURKE	90	10
P3185P 52		72	14	SWNE	STO	60 BAR 1	60 BAR RANCH	105	60

Appropriation	T	R	S	QQ	Permit Uses	Permit Facility Name	Permit Applicant	TD	SWL
P68803W	52	72	15	NWSW	MIS	GRANT #1	PAUL AND JANE ROURKE		
P52186W	52	72	16	NENE	MON	16 18	WY BOARD OF LAND COMMISSIONERS** SHELL OIL COMPANY		
P52184W	52	72	16	NENE	MON	16-1AC4	WY STATE BOARD OF LAND COMMISSIONERS** TRITON COAL COMPANY	71 28	
P52185W	52	72	16	NENE	MON	16-1A-02	WY STATE BOARD OF LAND COMMISSIONERS** TRITON COAL COMPANY	33 21.5	
P157784W 52		72	16	SWNE	STO	ROURKE #1	PAUL D. ROURKE** WY STATE BOARD OF LAND COMMISSIONERS		
P52201W	52	72	16	SWNE	MON	16-7A-C2	WY STATE BOARD OF LAND COMMISSIONERS** TRITON COAL COMPANY	71 9.4	
P62279W 52		72	16	SENE	MON	16-8D-A5	TRITON COAL COMPANY** WY STATE BOARD OF LAND COMMISSIONERS	45 8.16	
P157994W 52		72	16	SENE	STO	16-8D-A5	TRITON COAL COMPANY** WY STATE BOARD OF LAND COMMISSIONERS	43.5 8.16	
P118037W 52		72	16	SENE	MON	16-8C1-AL2	TRITON COAL COMPANY** WY STATE BOARD OF LAND COMMISSIONERS	19.4 7.96	
P118038W 52		72	16	SENE	MON	16-8C2-AL5	TRITON COAL COMPANY** WY STATE BOARD OF LAND COMMISSIONERS	17.8 7.98	
P54140W	52	72	16	NENW	MON	16-30-02	WY STATE BOARD OF LAND COMMISSIONERS** TRITON COAL COMPANY	128 53.3	
P63078W	52	72	16	NENW	MON	16-3B-C5	WY BOARD OF LAND COMMISSIONERS**MINING SHELL OIL COMPANY	200 -1	
P53963W 52		72	16	NENW	MON	16-3A0B	WY BOARD OF LAND COMMISSIONERS** SHELL OIL COMPANY		
P52188W	52	72	16	NWNW	MON	16-4B-C4	WY STATE BOARD OF LAND COMMISSIONERS** TRITON COAL COMPANY	180 132	
P54373W	52	72	16	NWNW	MON	16-4B2-C2	WY BOARD OF LAND COMMISSIONERS** SHELL OIL COMPANY		

Appropriation	T	R	S	QQ	Permit Uses	Permit Facility Name	Permit Applicant	TD	SWL
P55770W	52	72	16	SWNW	MON	16-5B-A4	WY BOARD OF LAND COMMISSIONERS** SHELL OIL COMPANY	30 19.2	
P54612W	52	72	16	SWNW	MON	16-6B1-5	WY BOARD OF LAND COMMISSIONERS** SHELL OIL COMPANY	80 1.73	
P55771W	52	72	16	SENW	MON	16-6C1-A2	WY STATE BOARD OF LAND COMMISSIONERS** TRITON COAL COMPANY	25 6.21	
P62283W	52	72	16	SENW	MON	16-6C-C5	TRITON COAL COMPANY** WY STATE BOARD OF LAND COMMISSIONERS	53 2.14	
P58630W	52	72	16	SENW	MON	16-6C-C5	WY BOARD OF LAND COMMISSIONERS** SHELL OIL COMPANY		
P55764W	52	72	16	SENW	MON	16-6C-A4	WY BOARD OF LAND COMMISSIONERS** SHELL OIL COMPANY	21 20	
P62282W	52	72	16	SENW	MON	16-6C-02	TRITON COAL COMPANY** WY STATE BOARD OF LAND COMMISSIONERS	16 5.4	
P53227W	52	72	16	NESW	MON	16 - 11A-02	WY BOARD OF LAND COMMISSIONERS** SHELL OIL COMPANY	140 -1	
P58635W	52	72	16	NESW	MON	16-11D1	WY BOARD OF LAND COMMISSIONERS** SHELL OIL COMPANY	40 -1	
P55775W	52	72	16	NESW	MON	16-11B-A4	WY BOARD OF LAND COMMISSIONERS** SHELL OIL COMPANY	29 -1	
P58636W	52	72	16	NESW	MON	16-11C1	WY BOARD OF LAND COMMISSIONERS** SHELL OIL COMPANY	-1 -1	
P53836W	52	72	16	NESW	IRR	HAY CREEK #1	WY BOARD OF LAND COMMISSIONERS**JANE OFFUTT ROURKE		
P63079W	52	72	16	NESW	MON	16-11C-C5	WY BOARD OF LAND COMMISSIONERS**MINING SHELL OIL COMPANY	20 -1	
P63075W	52	72	16	NESW	MON	16-11B-A5	WY BOARD OF LAND COMMISSIONERS**MINING SHELL OIL COMPANY	24.5 0.31	
P62274W	52	72	16	NESW	MON	16-11C-S10	TRITON COAL COMPANY** WY STATE BOARD OF LAND COMMISSIONERS	39.1 5.7	

Appropriation	T	R	S	QQ	Permit Uses	Permit Facility Name	Permit Applicant	TD	SWL
P63081W 52		72	16	NESW	MON	21-3D-C5	WY BOARD OF LAND COMMISSIONERS**MINING SHELL OIL COMPANY	222 -1	
P63082W 52		72	16	NWSW	MON	16-12B-5(1)	WY BOARD OF LAND COMMISSIONERS**MINING SHELL OIL COMPANY	37 -1	
P58638W	52	72	16	NWSW	MON	16-12D1	WY BOARD OF LAND COMMISSIONERS** SHELL OIL COMPANY	87 -1	
P52208W 52		72	16	SWSW	MON	16-13C-04	WY STATE BOARD OF LAND COMMISSIONERS** TRITON COAL COMPANY	152 82.2	
P62267W 52		72	16	SWSW	MON	16-13C-C5	WY STATE BOARD OF LAND COMMISSIONERS** TRITON COAL COMPANY	295 151	
P63076W 52		72	16	SWSW	MON	DRILL HOLE #1	WY BOARD OF LAND COMMISSIONERS**MINING SHELL OIL COMPANY	120 -1	
P118042W 52		72	16	SWSW	MON	16-13C-C5	TRITON COAL COMPANY** WY STATE BOARD OF LAND COMMISSIONERS	118.6 44.4	
P52206W	52	72	16	SWSW	MON	16-13C-C4	WY BOARD OF LAND COMMISSIONERS** SHELL OIL COMPANY	280 152	
P54369W	52	72	16	SWSW	MON	16-13C-C4	WY BOARD OF LAND COMMISSIONERS** SHELL OIL COMPANY		
P63077W 52		72	16	SWSW	MON	DRILL HOLE #2	WY BOARD OF LAND COMMISSIONERS**MINING SHELL OIL COMPANY	220 -1	
P52209W	52	72	16	SESW	MO	N 16-14A-C4	WY STATE BOARD OF LAND COMMISSIONERS** TRITON COAL COMPANY	51	
P53961W	52	72	16	SESW	MO	N 16-14AOB	WY BOARD OF LAND COMMISSIONERS** SHELL OIL COMPANY		
P53962W	52	72	16	SESW	MO	N 16-14ACO	WY BOARD OF LAND COMMISSIONERS** SHELL OIL COMPANY		
P62278W 52		72	16	NESE	MON	16-9D-A5	TRITON COAL COMPANY** WY STATE BOARD OF LAND COMMISSIONERS	28.9 10	
P52202W	52	72	16	NWSE	MON	16 10D	WY BOARD OF LAND COMMISSIONERS** SHELL OIL COMPANY		

Appropriation	T	R	S	QQ	Permit Uses	Permit Facility Name	Permit Applicant	TD	SWL
P55780W 52		72	16	SESE	MON	16-16B-A4	WY BOARD OF LAND COMMISSIONERS** SHELL OIL COMPANY	14 13.9	
P157993W 52		72	16	SESE	STO	16-16C-A5	TRITON COAL COMPANY** WY STATE BOARD OF LAND COMMISSIONERS	24 8.8	
P55781W 52		72	16	SESE	MON	16-16C-A4	WY BOARD OF LAND COMMISSIONERS** SHELL OIL COMPANY	18 8.35	
P52210W 52		72	16	SESE	MON	16-16D	WY BOARD OF LAND COMMISSIONERS** SHELL OIL COMPANY		
P156876W 52		72	17	SWNW	CBNG	TRITON 12C-1722	MAJESTIC PETROLEUM OPERATIONS, LLC	340	260
P158636W 52		72	17	NWSW	CBNG	TRITION 13C-1722	MAJESTIC PETROLEUM OPERATIONS, LLC	319	245
P156877W 52		72	17	SWSW	CBNG	TRITON 14C-1722	MAJESTIC PETROLEUM OPERATIONS, LLC	273	205
P145709W 52		72	17	NESE	MIS,CBNG,RES	TRITON 43AC-1722	Triton Coal Company** MAJESTIC PETROLEUM OPERATIONS, LLC	166 78	
P58647W 52		72	17	NESE	MON	17-9A-A5	WY STATE BOARD OF LAND COMMISSIONERS** TRITON COAL COMPANY	15 4.5	
P145708W	52	72	17	SWSE	MIS,CBNG,RES	TRITON 34AC-1722	Triton Coal Company** MAJESTIC PETROLEUM OPERATIONS, LLC	256 129	
P145707W 52		72	17	SESE	MIS,CBNG,RES	TRITON 44AC-1722	MAJESTIC PETROLEUM OPERATIONS, LLC** Triton Coal Company	210 117	
P110632W 52		72	18	NWNE	STO,CBNG	FRANKLIN 31C-1822	REDSTONE RESOURCES, INC.	270	94.5
P116606W 52		72	18	NENW	STO,CBNG	McGEE 21C-1822	REDSTONE RESOURCES, INC.	271	210
P108733W 52		72	18	NWNW	STO,CBNG	FRANKLIN 11C-1822	REDSTONE RESOURCES, INC	288	105
P115519W 52		72	18	SWNW	STO,CBNG	FRANKLIN 12C-1822	REDSTONE RESOURCES, INC.	325	249
P108732W 52		72	18	SENW	STO,CBNG	FRANKLIN 22C-1822	REDSTONE RESOURCES, INC	296	109
P107779W 52		72	18	NWSW	STO,MIS,CBNG	OEDEKOVEN 13C-1822	REDSTONE RESOURCES, INC	372	172
P108442W 52		72	18	SWSW	STO,CBNG	FRANKLIN 14C-1822	REDSTONE RESOURCES, INC	393	359
P83206W	52	72	18	SWSW	DOM	LAVERNE #1	CECLE L. AND LAVERNE L. COOK	85	55

Appropriation	T	R	S	QQ	Permit Uses	Permit Facility Name	Permit Applicant	TD	SWL
P108444W	52	72	18	SESW	STO, CBNG	FRANKLIN 24C-1822	REDSTONE RESOURCES, INC	368	159
P141899W	52	72	18	SESW	STO,CBNG	FRANKLIN 24CR-1822	MAJESTIC PETROLEUM OPERATIONS, LLC	370	298
P108446W	52	72	18	NWSE	STO,CBNG	FRANKLIN 33C-1822	REDSTONE RESOURCES, INC	329	127
P108452W	52	72	19	NWNE	STO,CBNG	FRANKLIN 31C-1922	REDSTONE RESOURCES, INC	452	187
P112364W	52	72	19	SENE	STO,CBNG	Isora CS #4	YATES PETROLEUM CORP.** SMC MINING COMPANY	436	63
P107780W	52	72	cl	NWNW	STO,MIS,CBNG	OEDEKOVEN 11C-1922	REDSTONE RESOURCES, INC	434	197
P102546W	52	72	19	NWSW	STO	OEDEKOVEN #31S-1922	BYRON F OEDEKOVEN	180	30
P61486W	52	72	19	SESE	STO	ODEKOVEN STOCK WELL #1	CHARLES R. OEDEKOVEN	100	10
P145711W	52	72	20	NENE	MIS,CBNG,RES	TRITON 41AC-2022	Triton Coal Company** MAJESTIC PETROLEUM OPERATIONS, LLC	261	165
P63083W	52	72	20	NWNE	MON	20-2C-C5 (PILOT HOLE)	WY BOARD OF LAND COMMISSIONERS**MINING SHELL OIL COMPANY	320	-1
P145710W	52	72	20	NWNE	MIS,CBNG,RES	TRITON 31AC-2022	Triton Coal Company** MAJESTIC PETROLEUM OPERATIONS, LLC	274	162
P145712W	52	72	20	SWNE	MIS,CBNG,RES	TRITON 32AC-2022	Triton Coal Company** MAJESTIC PETROLEUM OPERATIONS, LLC	333	191
P145713W	52	72	20	SENE	MIS,CBNG,RES	TRITON 42AC-2022	Triton Coal Company** MAJESTIC PETROLEUM OPERATIONS, LLC	300	204
P112367W	52	72	20	SWNW	STO,CBNG	Olin CS #2	YATES PETROLEUM CORP.** SMC MINING COMPANY	362	89
P112368W	52	72	20	NWSW	STO,CBNG	Olin CS #3	YATES PETROLEUM CORP.** SMC MINING COMPANY	322	196
P112369W	52	72	20	SWSW	STO,CBNG	Olin CS #4	YATES PETROLEUM CORP.** SMC MINING COMPANY	282	81
P58648W	52	72	21	NENW	MON	21-3-05	WY BOARD OF LAND COMMISSIONERS** SHELL OIL COMPANY	222	-1
P20029P	52	72	23	SESE	STO	CLARK #1	MARY J. CLARK	55	12

Appropriation	T	R	S	QQ	Permit Uses	Permit Facility Name	Permit Applicant	TD	SWL
25/11/152W	52	72	28	SWNW					
25/8/152W	52	72	28	SWNW					
25/10/152W	52	72	28	SWNW					
25/9/152W	52	72	28	SWNW					
P112361W 52		72	29	NENW	STO,CBNG	Isora CS #1	YATES PETROLEUM CORP.** SMC MINING COMPANY	402 50	
P112365W 52		72	29	NWNW	STO,CBNG	Isora CS #5	YATES PETROLEUM CORP.** SMC MINING COMPANY	402 112	
P112362W 52		72	30	NENE	STO,CBNG	Isora CS #2	YATES PETROLEUM CORP.** SMC MINING COMPANY	449 92	
P102867W 52		72	30	SWNE	STO,MIS,CBNG	OEDEKOVEN #32C-3022	REDSTONE RESOURCES, INC	354	201
P109588W 52		72	30	SWNE	STO,CBNG	OEDEKOVEN 32C2-3022	REDSTONE RESOURCES, INC.	363	221
P112363W 52		72	30	SENE	STO,CBNG	Isora CS #3	YATES PETROLEUM CORP.** SMC MINING COMPANY	404 134	
P104083W 52		72	30	NENW	STO,MIS,CBNG	TRITON 21C-3022	REDSTONE RESOURCES, INC	436	207
25/1/137W	52	72	30	NWNW					
P104081W 52		72	30	SWNW	STO,MIS,CBNG	TRITON 12C-3022	REDSTONE RESOURCES, INC	404.5	-1
P104082W 52		72	30	NWSW	STO,MIS,CBNG	TRITON 13C-3022	REDSTONE RESOURCES, INC	402	-1
P102867W 52		72	30	SWSW	STO,MIS,CBNG	OEDEKOVEN #32C-3022	REDSTONE RESOURCES, INC	354	201
P104092W 52		72	30	SWSW	STO,MIS,CBNG	TRITON #14C-3022	REDSTONE RESOURCES, INC	361.5	-1
25/8/99W	52	72	30	SWSW					
P104084W	52	72	30	SESW	STO,MIS,CBNG	TRITON 24C-3022	REDSTONE RESOURCES, INC	407	-1
P104080W 52		72	30	NWSE	STO,MIS,CBNG	TRITON 33A-3022	REDSTONE RESOURCES, INC		
P104529W 52		72	31	NENW	STO,MIS,CBNG	TRITON 21C-3122	REDSTONE RESOURCES, INC	356	220
P103485W 52		72	31	NWNW	STO,MIS,CBNG	TRITON #11A-3122	REDSTONE RESOURCES, INC	128	-1

Appropriation	T	R	S	QQ	Permit Uses	Permit Facility Name	Permit Applicant	TD	SWL
P104079W 52		72	31	NWNW	STO,MIS,CBNG	TRITON #11C-3122	REDSTONE RESOURCES, INC	371	162
P103183W 52		72	31	SWNW	STO,MIS,CBNG	OEDEKOVEN #12A-3122	REDSTONE RESOURCES, INC	126.5	-1
25/9/123W	52	72	31	SWNW					
25/7/123W	52	72	31	SWNW					
P131330W 52		72	31	SWNW	CBNG	TRITON 12D-3122	REDSTONE RESOURCES INC.	1232	685
25/8/123W	52	72	31	SWNW					
P103613W 52		72	31	SENW	STO,MIS,CBNG	TRITON #22A-3122	REDSTONE RESOURCES, INC	137	-1
P104078W 52		72	31	NESW	STO,MIS,CBNG	TRITON 22C-3122	REDSTONE RESOURCES, INC	345	-1
25/7/87W	52	72	31	NWSW					
25/9/87W	52	72	31	NWSW					
25/6/87W	52	72	31	NWSW					
25/5/87W	52	72	31	NWSW					
P113423W 52		72	31	NWSW	STO,CBNG	TRITON 13D-3122	REDSTONE RESOURCES, INC.	1227	250
25/8/87W	52	72	31	NWSW					
P103618W 52		72	31	NWSW	STO,MIS,CBNG	TRITON #13A-3122	REDSTONE RESOURCES, INC	110.5	-1
P104528W 52		72	31	SWSW	STO,MIS,CBNG	TRITON 14C-3122	REDSTONE RESOURCES, INC	370	0
P104077W	52	72	31	SESW	STO,MIS,CBNG	CABALLO 24C-3122	REDSTONE RESOURCES, INC	1206	-1
25/2/10W	52	72	31	SESW					
P108964W	52	72	31	SESW	STO,MIS,CBNG	MARQUISS 24D-3122	REDSTONE RESOURCES, INC.	1206	160
P103043W	52	72	31	SESW	STO, CBNG	MARQUISS #24A-3122	REDSTONE RESOURCES, INC	92	0
P103045W	52	72	31	SESW	STO,MIS,CBNG	LANDECK #13C-223	REDSTONE RESOURCES, INC		
24/8/151W	52	72	32	SWSE					
24/9/151W	52	72	32	SWSE					
24/12/151W	52	72	32	SWSE					

Appropriation	T	R	S	QQ	Permit Uses	Permit Facility Name	Permit Applicant	TD	SWL
24/7/151W	52	72	32	SWSE					
25/8/64W	52	73	0						
P109851W 52		73	1	NENE	STO,CBNG	HALL 41C-123	REDSTONE RESOURCES, INC.	360	180
P109049W 52		73	1	NWNE	STO,CBNG	HALL 31C-123	REDSTONE RESOURCES, INC.	351	153
P161013W 52		73	1	SENE	CBNG	HALL 42A-123	MAJESTIC PETROLEUM OPERATIONS, LLC	193	135
P107781W 52		73	1	SENE	STO,CBNG	HALL 42C-123	REDSTONE RESOURCES, INC	365	174
P26476W	52	73	1	NENW	MIS	HALL #5	MEADOWLARK FARMS INC.**JOY LUCILLE HALL	600	140
P109051W 52		73	1	NWNW	STO,MIS,CBNG	HALL 11C-123	REDSTONE RESOURCES, INC.	362	90
P103487W 52		73	1	SWNW	STO,MIS,CBNG	HALL #32C-123	REDSTONE RESOURCES, INC		
P109050W 52		73	1	SENW	STO,MIS,CBNG	HALL 22C-123	REDSTONE RESOURCES, INC.	346	111
P109040W 52		73	1	SWSW	STO,MIS,CBNG	HALL 14C-123	REDSTONE RESOURCES, INC.	456	200
P109278W 52		73	1	NWSE	STO,CBNG	HALL 33C-123	REDSTONE RESOURCES, INC.	331	131
P107782W 52		73	1	SESE	STO,CBNG	OEDEKOVEN 22C-722	REDSTONE RESOURCES, INC	434	216
P103179W 52		73	2	NENE	STO,MIS,CBNG	HALL #41C-223	REDSTONE RESOURCES, INC		
P109041W 52		73	2	NWNE	STO,MIS,CBNG	HALL 31C-223	REDSTONE RESOURCES, INC.	409	153
P103181W 52		73	2	NWNE	STO,MIS,CBNG	HALL #31C-223	REDSTONE RESOURCES, INC		
P103178W 52		73	2	SWNE	STO,MIS,CBNG	HALL #32C-223	REDSTONE RESOURCES, INC		
P118218W 52		73	2	NENW	STO,CBNG	Landeck Fed 21C-223	DEVON ENERGY PRODUCTION CO. L.P.	498	295
P103475W 52		73	2	NWNW	STO,MIS,CBNG	LANDECK #11C-223	REDSTONE RESOURCES, INC		
P177789W 52		73	2	SWNW	STO,CBNG	LANDECK 12C-223	DEVON ENERGY PRODUCTION CO. L.P.	489	153
P110633W 52		73	2	SWNW	STO,CBNG	LANDECK 12C-223	REDSTONE RESOURCES, INC.	489	154
P135506W 52		73	2	SWNW	CBNG	LANDECK 12A-223	DEVON ENERGY PRODUCTION CO. L.P.	170	149
P131903W	52	73	2	SWNW	CBNG	Landeck 12W - 223	DEVON ENERGY PRODUCTION CO. L.P.	768	426
P116607W 52		73	2	NESW	STO,CBNG	LANDECK 23C-223	DEVON ENERGY PRODUCTION CO. L.P.	494	377

Appropriation	T	R	S	QQ	Permit Uses	Permit Facility Name	Permit Applicant	TD	SWL
P103045W 52		73	2	NWSW	STO,MIS,CBNG	LANDECK #13C-223	REDSTONE RESOURCES, INC		
P131901W	52	73	2	SWSW	CBNG	Landeck 14W - 223	DEVON ENERGY PRODUCTION CO. L.P.	800	612
P35585W	52	73	2	SWSW	MON	B2 9C	GULF MINERAL RESOURCES COMPANY	547	-1
P26478W 52		73	2	SESW	MIS	HALL #7	MEADOWLARK FARMS INC.**JOY LUCILLE HALL	520	210
P109043W 52		73	2	NESE	STO,MIS,CBNG	HALL 43C-223	REDSTONE RESOURCES, INC.	390	133
P103186W 52		73	2	NESE	STO,MIS,CBNG	HALL #43C-223	REDSTONE RESOURCES, INC		
P131897W	52	73	2	NESE	CBNG	Hall 43 W - 223	DEVON ENERGY PRODUCTION CO. L.P.	724	212
P103184W 52		73	2	NWSE	STO,MIS,CBNG	HALL #33C-223	REDSTONE RESOURCES, INC		
P103185W 52		73	2	SWSE	STO,MIS,CBNG	HALL #34C-223	REDSTONE RESOURCES, INC		
P103182W 52		73	2	SESE	STO,MIS,CBNG	HALL #44C-223	REDSTONE RESOURCES, INC		
P109042W 52		73	2	SESE	STO,MIS,CBNG	HALL 34C-223	REDSTONE RESOURCES, INC.	460	191
P110635W 52		73	3	NENE	STO,CBNG	LANDECK 41C-323	REDSTONE RESOURCES, INC.	499	147
P177786W 52		73	3	NENE	STO,CBNG	LANDECK 41C-323	DEVON ENERGY PRODUCTION CO. L.P.	499	147
P131895W	52	73	3	SWNE	CBNG	Landeck 32W - 323	DEVON ENERGY PRODUCTION CO. L.P.	787	776
P103187W 52		73	3	SWNE	STO,MIS,CBNG	LANDECK #32C-323	DEVON ENERGY PRODUCTION CO. L.P.		
P101093W 52		73	3	SWNE	MON	LANDECK ST 423-1	REDSTONE RESOURCES, INC	588	88
P135514W 52		73	3	SWNE	CBNG	LANDECK 32A-323	DEVON ENERGY PRODUCTION CO. L.P.	187	132
P103044W 52		73	3	SENE	STO,MIS,CBNG	LANDECK #42C-323	REDSTONE RESOURCES, INC		
24/1/411W	52	73	3	NESW					
P110216W	52	73	3	NESW	STO,CBNG	LANDECK 23B-323	Redstone Resources	800	141
P102865W 52		73	3	NESW	STO,MIS,CBNG	LANDECK #23C-323	DEVON ENERGY PRODUCTION CO. L.P.	480	-4
24/3/411W	52	73	3	NESW					
39/4/414W 52		73	3	NESW	STO,MIS	LANDECK 23B-423	DEVON ENERGY PRODUCTION CO. L.P.		
P116620W 52		73	3	SESW	STO,CBNG	LANDECK 24B2-323	DEVON ENERGY PRODUCTION CO. L.P.	788	160

Appropriation	T	R	S	QQ	Permit Uses	Permit Facility Name	Permit Applicant	TD	SWL
P102866W 52		73	3	NESE	STO,MIS,CBNG	LANDECK #43C-323	DEVON ENERGY PRODUCTION CO. L.P.		
P36326W 52		73	3	NESE	MON	B3-13C #1	GULF MINERAL RESOURCES COMPANY**J. F. MUIRHEAD		
P131893W 52		73	3	NESE	CBNG	Landeck 43W2 - 323	DEVON ENERGY PRODUCTION CO. L.P.	785	748
P135519W 52		73	3	NESE	CBNG	LANDECK 43A-323	DEVON ENERGY PRODUCTION CO. L.P.	179	-7
P135516W 52		73	3	SWSE	CBNG	LANDECK 34A-323	DEVON ENERGY PRODUCTION CO. L.P.	153	132
P159038W 52		73	3	SWSE	CBNG,RES	LANDECK 03-1	DEVON ENERGY PRODUCTION COMPANY, L.P.**WILLIAM A. LANDECK	499 89	
39/9/425W 52		73	10	NENE	STO,CBNG	HINKES 41C-1023	DEVON ENERGY PRODUCTION CO. L.P.		
P108242W 52		73	10	NENE	STO,CBNG	HINKES 41C-1023	DEVON ENERGY PRODUCTION COMPANY, L.P	489	112
P131909W 52		73	10	NENE	CBNG	Hinkes 41A - 1023	DEVON ENERGY PRODUCTION CO. L.P.	152	140
P108736W 52		73	10	SWNE	STO,CBNG	HINKES 32C-1023	DEVON ENERGY PRODUCTION COMPANY, L.P	802	745
P131892W 52		73	10	NENW	CBNG	Landeck 21A-1023	DEVON ENERGY PRODUCTION CO. L.P.	235	141
P106271W 52		73	10	NENW	STO,CBNG	LANDECK 21B-1023	REDSTONE RESOURCES, INC	750	400
P106789W 52		73	10	NENW	STO,CBNG	LANDECK 21C-1023	DEVON ENERGY PRODUCTION CO. L.P.	473	99
P131905W 52		73	10	NESW	CBNG	Landeck 23W-1023	DEVON ENERGY PRODUCTION CO. L.P.	858	628
P131891W 52		73	10	NESW	CBNG	Landeck 23A-1023	DEVON ENERGY PRODUCTION CO. L.P.	270	230
P159035W 52		73	10	NESW	CBNG,RES	LINDQUIST 23C-1023	DEVON ENERGY PRODUCTION COMPANY, L.P.**WILLIAM A. LANDECK	583 151	
25/3/42W	52	73	10	SESW					
25/12/46W	52	73	10	SESW					
25/5/42W	52	73	10	SESW					
25/6/42W	52	73	10	SESW					
P103476W	52	73	10	SESW	STO,MIS,CBNG	LANDECK #24C-1023	REDSTONE RESOURCES, INC		
25/8/42W	52	73	10	SESW					

Appropriation	T	R	S	QQ	Permit Uses	Permit Facility Name	Permit Applicant	TD	SWL
25/2/42W	52	73	10	SESW					
25/11/46W	52	73	10	SESW					
25/10/46W	52	73	10	SESW					
25/4/42W	52	73	10	SESW					
25/9/42W	52	73	10	SESW					
25/7/42W	52	73	10	SESW					
P108245W 52		73	10	NESE	STO,CBNG	HINKES 43C-1023	REDSTONE RESOURCES, INC	447	113
P131911W 52		73	10	NESE	CBNG	Hinkes 43 A - 1023	DEVON ENERGY PRODUCTION CO. L.P.	209	94.5
39/7/425W 52		73	10	NESE	STO,CBNG	HINKES 43C-1023	DEVON ENERGY PRODUCTION CO. L.P.		
P131908W	52	73	10	SWSE	CBNG	Hinkes 34W - 1023	DEVON ENERGY PRODUCTION CO. L.P.	823	790
P108246W	52	73	10	SWSE	STO, CBNG	HINKES 34C-1023	REDSTONE RESOURCES, INC	480.5	119
P131907W	52	73	10	SWSE	CBNG	Hinkes 34A - 1023	DEVON ENERGY PRODUCTION CO. L.P.	266	163
39/6/425W	52	73	10	SWSE	STO,CBNG	HINKES 34C-1023	DEVON ENERGY PRODUCTION CO. L.P.		
P130318W 52		73	11	NENE	CBNG	HALL 41A-1123	DEVON ENERGY PRODUCTION CO. L.P.	304	160
P109046W 52		73	11	NENE	STO,MIS,CBNG	HALL 41C-1123	REDSTONE RESOURCES, INC.	534	232
P131919W 52		73	11	SWNE	CBNG	HALL 32A-1123	DEVON ENERGY PRODUCTION CO. L.P.	383	197
P109045W 52		73	11	SWNE	STO,MIS,CBNG	HALL 32C-1123	REDSTONE RESOURCES, INC.	488	174
P131920W 52		73	11	SWNE	CBNG	HALL 32W-1123	DEVON ENERGY PRODUCTION CO. L.P.	803	765
P109044W 52		73	11	NENW	STO,CBNG	HINKES 21C-1123	REDSTONE RESOURCES, INC.	456	143
P108243W 52		73	11	SWNW	STO,CBNG	HINKES 12C-1123	DEVON ENERGY PRODUCTION COMPANY, L.P	425	101
39/8/425W 52		73	11	SWNW	STO,CBNG	HINKES 12C-1123	DEVON ENERGY PRODUCTION CO. L.P.		
P131652W 52		73	11	SWNW	CBNG	HINKES 12A-1123	DEVON ENERGY PRODUCTION CO. L.P.	230	130
P131917W 52		73	11	NESW	CBNG	Hinkes 23A-1123	DEVON ENERGY PRODUCTION CO. L.P.	285	175
P132275W 52		73	11	NESW	CBNG	TWENTY MILE 43W-1123	DEVON ENERGY PRODUCTION CO. L.P.	811	758

Appropriation	T	R	S	QQ	Permit Uses	Permit Facility Name	Permit Applicant	TD	SWL
P108866W 52		73	11	NESW	STO,CBNG	HINKES 23C-1123	DEVON ENERGY PRODUCTION COMPANY, L.P	413	116
P131914W 52		73	11	SWSW	CBNG	Hinkes 14 W - 1123	DEVON ENERGY PRODUCTION CO. L.P.	774	486
P108247W 52		73	11	SWSW	STO,CBNG	HINKES 14C-1123	REDSTONE RESOURCES, INC	460	127
39/5/425W 52		73	11	SWSW	STO,CBNG	HINKES 14C-1123	DEVON ENERGY PRODUCTION CO. L.P.		
P131651W 52		73	11	SWSW	CBNG	HINKES 14A-1123	DEVON ENERGY PRODUCTION CO. L.P.	198	125
P130319W 52		73	11	NESE	CBNG	TWENTY MILE 43A-1123	DEVON ENERGY PRODUCTION CO. L.P.	323	152
P131921W 52		73	11	NESE	CBNG	TWENTY MILE 43 C-1123	DEVON ENERGY PRODUCTION CO. L.P.	538	489
P131926W	52	73	11	SWSE	CBNG	TWENTY MILE 34A-1123	DEVON ENERGY PRODUCTION CO. L.P.	340	178
P132273W	52	73	11	SWSE	CBNG	TWENTY MILE 34W-1123	DEVON ENERGY PRODUCTION CO. L.P.	792	602
P120894W	52	73	11	SWSE	STO,CBNG	Twenty Mile 34C-1123	DEVON ENERGY PRODUCTION CO. L.P.	508	385
P109048W 52		73	11	SESE	STO,CBNG	TWENTY MILE 44C-1123	REDSTONE RESOURCES, INC.	516	169
P108435W 52		73	12	NENE	STO,CBNG	COOK 41C-1223	REDSTONE RESOURCES, INC	390	330
P108431W 52		73	12	NWNE	STO,CBNG	COOK 31C-1223	REDSTONE RESOURCES, INC	373	137
P141900W 52		73	12	NENW	STO,CBNG	COOK 21A1-1223	MAJESTIC PETROLEUM OPERATIONS, LLC	105	71
P108427W 52		73	12	NENW	STO,CBNG	COOK 21C-1223	MAJESTIC PETROLEUM OPERATIONS, LLC	429	379
P108423W 52		73	12	NWNW	STO,CBNG	COOK 11C-1223	MAJESTIC PETROLEUM OPERATIONS, LLC	497	202
P142354W 52		73	12	SWNW	STO,CBNG	COOK 12W-1223	MAJESTIC PETROLEUM OPERATIONS, LLC	834	295
P108424W 52		73	12	SWNW	STO,CBNG	COOK 12C-1223	MAJESTIC PETROLEUM OPERATIONS, LLC	539	473
P130156W 52		73	12	SWNW	CBNG	COOK 12A-1223	MAJESTIC PETROLEUM OPERATIONS, LLC	312	200
P108428W 52		73	12	SENW	STO,CBNG	COOK 22C-1223	MAJESTIC PETROLEUM OPERATIONS, LLC	435	170
P108425W 52		73	12	NWSW	STO,CBNG	COOK 13C-1223	MAJESTIC PETROLEUM OPERATIONS, LLC	522	231
P131321W 52		73	12	SWSW	CBNG	COOK 14A-1223	MAJESTIC PETROLEUM OPERATIONS, LLC	295	210
P108426W 52		73	12	SWSW	STO,CBNG	COOK 14C-1223	MAJESTIC PETROLEUM OPERATIONS, LLC	520	472
P108430W	52	73	12	SESW	STO,CBNG	COOK 24C-1223	REDSTONE RESOURCES, INC	466	221

Appropriation	T	R	S	QQ	Permit Uses	Permit Facility Name	Permit Applicant	TD	SWL
P108433W 52		73	12	NWSE	STO,MIS,CBNG	COOK 33C-1223	REDSTONE RESOURCES, INC	395	14
P108434W	52	73	12	SWSE	STO,CBNG	COOK 34C-1223	REDSTONE RESOURCES, INC	380	357
P141901W	52	73	12	SWSE	STO,CBNG	COOK 34A-1223	MAJESTIC PETROLEUM OPERATIONS, LLC	154	119
P108438W 52		73	12	SESE	STO,CBNG	COOK 44C-1223	REDSTONE RESOURCES, INC	310	12
P110084W 52		73	13	NENE	STO,CBNG	COOK 41C-1323	MAJESTIC PETROLEUM OPERATIONS, LLC	332	90.5
P107670W 52		73	13	NWNE	STO,CBNG	COOK 31C-1323	REDSTONE RESOURCES, INC	389	58.5
P131654W 52		73	13	SWNE	CBNG	COOK 32A-1323	MAJESTIC PETROLEUM OPERATIONS, LLC	233	212
P33812W	52	73	13	SENE	DOM,STO	COOK #1	CECLE L. COOK	130	50
P107783W 52		73	13	SENE	STO,CBNG	COOK 42C-1323	MAJESTIC PETROLEUM OPERATIONS, LLC	393	119
P109047W 52		73	13	NWNW	STO,CBNG	COOK 11C-1323	REDSTONE RESOURCES, INC.	536	257
P120603W 52		73	13	SENW	STO,CBNG	Cook 22C3-1323	DEVON ENERGY PRODUCTION CO. L.P.	604	583
P67024W	52	73	13	NESW	DOM	RAY #1	DARRELL RAY	296	134
P107600W 52		73	13	NESW	STO,MIS,CBNG	OEDEKOVEN 23C-1323	REDSTONE RESOURCES, INC	539	247
P131650W 52		73	13	NESW	CBNG	OEDEKOVEN 23A-1323	REDSTONE RESOURCES INC.	300	53
P67063W 52		73	13	NESW	DOM	PETERSEN #1	KERRY L. PETERSEN	250	85
P110083W 52		73	13	NWSW	STO,CBNG	GEIGER 13C-1323	REDSTONE RESOURCES, INC.	440	214
P111695W 52		73	13	SWSW	STO,CBNG	Geiger 14C-1323	DEVON ENERGY PRODUCTION CO. L.P.	461	59
P107929W	52	73	13	SESW	STO,MIS,CBNG	OEDEKOVEN 24C-1323	REDSTONE RESOURCES, INC	525	230
P107601W	52	73	13	SWSE	STO,MIS,CBNG	OEDEKOVEN 34C-1323	REDSTONE RESOURCES, INC	585	293
P131649W	52	73	13	SWSE	CBNG	OEDEKOVEN 34A-1323	REDSTONE RESOURCES INC.	298	190
P107038W 52		73	13	SESE	CBNG,MIS	OEDEKOVEN 44C-1323	REDSTONE RESOURCES, INC	523	290
P142661W	52	73	14	SWNE	CBNG	TWENTY MILE 32A-1423	REDSTONE RESOURCES INC.	370	242
P122295W 52		73	14	SWNE	STO,CBNG	Twenty Mile 32C-1423	DEVON ENERGY PRODUCTION COMPANY, L.P	511	379
P131643W 52		73	14	SWNE	CBNG	TWENTY MILE 32A-1423	DEVON ENERGY PRODUCTION CO. L.P.	370	242

Appropriation	T	R	S	QQ	Permit Uses	Permit Facility Name	Permit Applicant	TD	SWL
P8545P	52	73	14	NENW	STO	MOREL #3	MAURICE MOREL	4	-4
39/4/425W 52		73	14	NENW	STO,CBNG	TWENTY MILE 21C-1423	DEVON ENERGY PRODUCTION CO. L.P.		
P162008W 52		73	14	NENW	CBNG	TWENTY MILE 21C-1423	20 MILE LAND COMPANY** DEVON ENERGY PRODUCTION CO. L.P.		
P8543P	52	73	14	NWNW	DOM,STO	MOREL #1	MAURICE MOREL	185	80
P159023W 52		73	14	SWNW	CBNG,RES	TWENTY MILE 12C2-1423	DEVON ENERGY PRODUCTION COMPANY, L.P.** 20 MILE LAND COMPANY	577 348	
P8412W	52	73	14	SENW	STO	MOREL #4	MAURICE MOREL	84	10
P103580W 52		73	14	SENW	DOM	JANISH #1	DAVE JANISH	790	250
P120895W 52		73	14	NESW	STO,CBNG	Twenty Mile 23C-1423	DEVON ENERGY PRODUCTION COMPANY, L.P	592	397
P132280W 52		73	14	SWSW	CBNG	TWENTY MILE 14W-1423	DEVON ENERGY PRODUCTION CO. L.P.	884	814
P15860W 52		73	14	NESE	STO	PITT #1	REGINALD PARNELL	102	37
P94853W	52	73	14	SWSE	STO	HARDY A1	KELLY HARDY	222	70
P122288W	52	73	14	SWSE	STO,CBNG	HUSKINSON 34C-1423	DEVON ENERGY PRODUCTION COMPANY, L.P	536	307
39/1/502W 52		73	14	SWSE	DOM,MIS	DIRT WORLD #1	CHUCK & MARRIA RUIZ		
P94590W 52		73	14	SESE	MON	GVE-MW2	GREEN VALLEY ESTATES	33	22.5
P132287W 52		73	15	NENE	CBNG	TWENTY MILE 41D-1523	DEVON ENERGY PRODUCTION CO. L.P.	1349	579
P107784W 52		73	15	NENE	STO,CBNG	TWENTY MILE 41C-1523	REDSTONE RESOURCES, INC	496	132
P132285W 52		73	15	NENE	CBNG	TWENTY MILE 32A-1523	DEVON ENERGY PRODUCTION CO. L.P.	312	188
P132289W 52		73	15	NENE	CBNG	TWENTY MILE 41A-1523	DEVON ENERGY PRODUCTION CO. L.P.	206	141
P174683W 52		73	15	NENE	CBNG	TWENTY MILE 41LC-1523	DEVON ENERGY PRODUCTION CO. L.P.** 20 Mile Land Co.		
P8544P	52	73	15	SENE	STO	MOREL #2	MAURICE MOREL	120	20
P174685W 52		73	15	NENW	CBNG	TWENTY MILE 21C-1523	DEVON ENERGY PRODUCTION CO. L.P.** 20 Mile Land Co.		

Appropriation	T	R	S	QQ	Permit Uses	Permit Facility Name	Permit Applicant	TD	SWL
P132288W 52		73	15	NESE	CBNG	TWENTY MILE 43A-1523	DEVON ENERGY PRODUCTION CO. L.P.	223	147
P132286W	52	73	15	SWSE	CBNG	TWENTY MILE 34A-1523	DEVON ENERGY PRODUCTION CO. L.P.	302	190
P132291W 52		73	22	NENE	CBNG	TWENTY MILE 41A-2223	DEVON ENERGY PRODUCTION CO. L.P.	247	159
P159019W 52		73	22	NENE	CBNG,RES	TWENTY MILE 41C-2223	DEVON ENERGY PRODUCTION COMPANY, L.P.** 20 MILE LAND COMPANY	535 200	
P132290W 52		73	22	SWNE	CBNG	TWENTY MILE 32A-2223	DEVON ENERGY PRODUCTION CO. L.P.	308	230
P115820W 52		73	22	SWNE	STO,CBNG	TWENTY MILE 32C-2223	DEVON ENERGY PRODUCTION CO. L.P.	603	248
P137337W 52		73	22	NESE	CBNG	TWENTY MILE FED 43C-2223	DEVON ENERGY PRODUCTION CO. L.P.	582	498
P137334W	52	73	22	SWSE	CBNG	TWENTY MILE FED 34C-2223	DEVON ENERGY PRODUCTION CO. L.P.	699	621
P118851W 52		73	23	NENE	STO,CBNG	Green Valley 41C-2323	REDSTONE RESOURCES, INC.	530	55
P161032W 52		73	23	NENE	CBNG	MOREL 41A-2323	MAJESTIC PETROLEUM OPERATIONS, LLC	308	250
P120897W	52	73	23	SWNE	STO,CBNG	Triton 32C-2323	Redstone Resources	689	545
P42086W 52		73	23	SWNE	MIS	MOREL #1	MAURICE MOREL**ROBERT MOREL**GERALD MOREL** S AND R LAND CO.	1260 370	
P91376W	52	73	23	SWNE	MIS	MOREL #1	GREEN VALLEY ESTATES	1260	370
P159049W 52		73	23	SWNE	CBNG,RES	MOREL 32CR-2323	DEVON ENERGY PRODUCTION COMPANY, L.P.**GERALD M MOREL	688 250	
P108931W 52		73	23	SENE	STO,CBNG	TRITON 42C-2323	REDSTONE RESOURCES, INC.	576	308
P149408W	52	73	23	SENE	DOM,STO	CODY # 1	CODY JOSLYN		
P127901W 52		73	23	NENW	CBNG	TWENTY MILE 21C-2323	DEVON ENERGY PRODUCTION CO. L.P.	632	327
P34476W	52	73	23	SENW	MON	MOREL #1 TEST HOLE	MAURICE MOREL** S & R LAND COMPANY**ROBERT MOREL**GERALD MOREL	1260 370	
P137328W 52		73	23	SWSW	CBNG	TWENTY MILE FED 14C-2323	REDSTONE RESOURCES INC.		
P116611W 52		73	23	NESE	STO,CBNG	TRITON 43C-2323	DEVON ENERGY PRODUCTION CO. L.P.	657	218
P115504W	52	73	24	NENE	STO	ROBB E #1E BYRON	F/MARJORIE OEDEKOVEN 300		75

Appropriation	T	R	S	QQ	Permit Uses	Permit Facility Name	Permit Applicant	TD	SWL
P106641W 52		73	24	NENE	STO,MIS,CBNG	OEDEKOVEN 41C-2423	REDSTONE RESOURCES, INC	466	223
P108421W 52		73	24	NWNE	STO,MIS,CBNG	OEDEKOVEN 31C-2423	REDSTONE RESOURCES, INC	540	261
P107599W 52		73	24	NENW	STO,MIS,CBNG	OEDEKOVEN 21C-2423	REDSTONE RESOURCES, INC	466	197
P110086W	52	73	24	NWNW	STO,CBNG	MOREL 11C-2423	REDSTONE RESOURCES, INC.	519	315
40/4/291W 52		73	24	NWNW	MIS	GREEN VALLEY NO II PHASE III	GERALD M & LOIS A MOREL		
P149409W 52		73	24	SWNW	DOM,STO	SCOTT JOSLYN #1	SCOTT JOSLYN		
P118850W 52		73	24	SWNW	STO,CBNG	Green Valley 12C-2423	REDSTONE RESOURCES, INC.	570	102
P115512W	52	73	24	SENW	STO	ROBB W #1W	BYRON F/MARJORIE OEDEKOVEN	43.4	6
P92236W	52	73	24	SENW	DOM,STO	PALMER #1	GENE AND GLENDA PALMER	655	200
P107928W 52		73	24	NESW	STO,MIS,CBNG	OEDEKOVEN 23C-2423	REDSTONE RESOURCES, INC	550	285
P116619W 52		73	24	SWSW	STO,CBNG	TRITON 14C-2423	DEVON ENERGY PRODUCTION CO. L.P.	622	468
P107737W 52		73	24	NESE	STO,CBNG	OEDEKOVEN 43C-2423	REDSTONE RESOURCES, INC	452	254
P109591W 52		73	24	NWSE	STO,MIS,CBNG	OEDEKOVEN 33C2-2423	REDSTONE RESOURCES, INC.	439	165
P104886W	52	73	24	SWSE	STO,MIS,CBNG	OEDEKOVEN 34SA-2423	REDSTONE RESOURCES, INC	456	236
P104887W 52		73	24	SESE	STO,MIS,CBNG	OEDEKOVEN 44SC-2423	REDSTONE RESOURCES, INC	457	249
25/11/287W	52	73	25	NENE					
25/1/288W	52	73	25	NENE					
P106510W 52		73	25	NENE	STO,MIS,CBNG	TRITON 41C-2523	REDSTONE RESOURCES, INC	412	185
25/12/287W	52	73	25	NENE					
P112366W 52		73	25	NWNE	STO,CBNG	Olin CS #1	YATES PETROLEUM CORP.** SMC MINING COMPANY		
P103616W 52		73	25	SENE	STO,MIS,CBNG	TRITON #42A-2523	REDSTONE RESOURCES, INC	178.5	-1
P107785W 52		73	25	NENW	STO,CBNG	TRITION 21C-2523	REDSTONE RESOURCES, INC	529	255
P150294W 52		73	25	NENW	DOM	SANTISTEVAN # 1	CHRIS SANTISTEVAN	890	432

Appropriation	T	R	S	QQ	Permit Uses	Permit Facility Name	Permit Applicant	TD	SWL
P69602W	52	73	25	NWNW	DOM	SULLIVAN #1	CHARLES P. SULLIVAN	820	400
P159024W	52	73	25	NWNW	CBNG,RES	TRITION 11A-2523	DEVON ENERGY PRODUCTION COMPANY, L.P.** TRITON COAL COMPANY	419 181	
P56384W	52	73I	25	NWNW	DOM,STO	PINEVIEW #1	HELEN HAFLING		
P63294W	52	73	25	NWNW	DOM	REISTER #1	CLYDE LANCE REISTER		
40/8/15W	52	73	25	NWNW	DOM	KLINE #1	THOMAS KLINE		
P56385W	52	73	25	SWNW	DOM,STO	PINEVIEW #2	HELEN HAFLING	785	300
P154536W	52	73	25	SWNW	MIS	GLORY HOLE #1	GLORY HOLE HOMEOWNERS ASSN.	1200	565
P114668W	52	73	25	SWNW	STO,CBNG	WARE 12C-2523	DEVON ENERGY PRODUCTION CO. L.P.	645	448
P41579W	52	73	25	SWNW	DOM	BREDTHAUER #1	CHARLES E. AND CINDY S. BREDTHAUER	705	350
P65773W	52	73	25	SWNW	MIS	ENL BREDTHAUER #1	CHARLES E. & CINDY S. BREDTHAUER	705	320
P177565W	52	73	25	SENW	DOM	BREDTHAUER #1 REPLACEMENT WELL	CHARLES E & CINDY S. BREDTHAUER		
P112700W	52	73	25	SENW	STO,CBNG	TRITON 22EB-2523	REDSTONE RESOURCES, INC.	0	0
P51185W	52	73	25	SENW	DOM	H H #1	SUSAN M MOORE	660	240
P110161W	52	73	25	SENW	DOM	MATLACK #1	GLENDA H MATLACK	665	100
39/8/305W	52	73	25	SENW	MIS	BREDTHAVER #1 REPLACEMENT WELL	CHARLES E. & CINDY S. BREDTHAVER		
P111067W	52	73	25	NWSW	DOM,STO	Eberlein 1	RICHARD EBERLEIN		
P55199W	52	73	25	NWSW		BRUSKI #1	LAWRENCE BRUSKI	330	160
P56386W	52	73	25	NWSW	DOM,STO	PINEVIEW #3	HELEN HAFLING		
P114669W	52	73	25	NWSW	STO,CBNG	COLEMAN 13C-2523	REDSTONE RESOURCES, INC.	325	-1
P168613W	52	73	25	NWSW	DOM	DCW #1	DANA & CHRISTINE WILLIAMS**MIKE & LORI CADA**JARED BRYAN	760 385	
P59551W	52	73	25	NWSW	DOM	CONNOLLY #1	JACK P. & VICTORIA L. CONNOLLY	800	375

Appropriation	T	R	S	QQ	Permit Uses	Permit Facility Name	Permit Applicant	TD	SWL
P72895W 52		73	25	SWSW	DOM,STO	PINEVIEW #4	ROGER & MARY MAKI**BROOK & LORI BAHNSON**MARK THOMAS	790 365	
P114670W 52		73	25	SWSW	STO,CBNG	HOLDEN 14C-2523	DEVON ENERGY PRODUCTION CO. L.P.	516	54
P73385W	52	73	25	SWSW	DOM,STO	BRIGGS #1	ALBERT L. BRIGGS	755	300
P56387W 52		73	25	SWSW	DOM,STO	PINEVIEW #4	HELEN HAFLING		
P157966W 52		73	25	SESW	DOM	JEWETT #1	JAMES & KAREN JEWETT	650	404
25/10/123W	52	73	25	NESE					
25/11/123W	52	73	25	NESE					
25/3/124W	52	73	25	NESE					
25/1/124W	52	73	25	NESE					
25/12/123W	52	73	25	NESE					
25/2/124W	52	73	25	NESE					
P103615W 52		73	25	NWSE	STO,MIS,CBNG	TRITON #33A-2523	REDSTONE RESOURCES, INC	163	0
P34782W	52	73	25	SWSE	DOM,STO	S BARBOUR #1	STEVEN R. OR GEORGIA L. BARBOUR	200	120
P66876W 52		73	25	SWSE	DOM	S. BARBOUR #2	STEVEN R. OR GEORGIA L. BARBOUR	717	350
P117223W 52		73	25	SESE	STO,CBNG	NORTH KITTY FEE #44-25	KENNEDY OIL	660	410
P103617W 52		73	25	SESE	STO,MIS,CBNG	TRITON #44A-2523	REDSTONE RESOURCES, INC	153	0
P106511W 52		73	25	SESE	STO,MIS,CBNG	TRITON 44C-2523	REDSTONE RESOURCES, INC	395	-4
39/6/454W	52	73	25		DOM	ROGERS #1	RALPH & LAURA ROGERS		
P57369W 52		73	26	NWNE	DOM,STO	HOLDEN #1	ORVIL L. HOLDEN	625	170
P47170W	52	73	26	NWNE	DOM,STO	HOLDEN #1	ORVIL L. HOLDEN		
P43866W 52		73	26	SWNE	DOM,STO	ELDRIDGE #1	EDWARD W. & LINDA K. ELDRIDGE	325	175
P109627W 52		73	26	NENW	STO,CBNG	TRITON FEDERAL 21C-2623	REDSTONE RESOURCES, INC.	700	276
39/10/543W 52		73	26	NENW	DOM,STO	ELDRIDGE #2	EDWARD W. & LINDA K. ELDRIDGE		

Appropriation	T	R	S	QQ	Permit Uses	Permit Facility Name	Permit Applicant	TD	SWL
39/1/426W 52		73	26	NENW	STO,CBNG	TRITON FEDERAL 21C-2623	DEVON ENERGY PRODUCTION CO. L.P.		
P36583W 52		73	26	NESW	DOM,STO	RAYS #2	RAYMOND PODENSKI	580	475
P38967W 52		73	26	NWSW	DOM	JOHNSON WELL #1	BOB LEROY JOHNSON	260	200
P141398W 52		73	26	SWSW	CBNG	TWENTY MILE 14A-2623	DEVON ENERGY PRODUCTION CO. L.P.	573	429
P115521W 52		73	26	SWSW	STO,CBNG	TWENTY MILE 14C-2623	REDSTONE RESOURCES, INC.	741	240
P65774W 52		73	26	NESE	MIS	B-WEST #1	BREDTHAUER-WEST HOME OWERNERS ASSOCIATION	710 150	
P122771W 52		73	26	NESE	STO,CBNG	MOORE 43C-2623	DEVON ENERGY PRODUCTION CO. L.P.	639	278
P123899W	52	73	26	NWSE	DOM,STO	ELLISTON #1	ELLISTON COMPANY		
P161014W	52	73	26	SWSE	CBNG	20-MILE 34A-2623	MAJESTIC PETROLEUM OPERATIONS, LLC	268	170
P43864W	52	73	26	SWSE	DOM,STO	ONETIA #1	HORACE RAY COLLINS	442	225
P65156W	52	73	26	SWSE	DOM	BUTCHER #1	DUANE BUTCHER	790	475
P144736W	52	73	27	NWSE	CBNG	NORTH KITTY FEREDAL 33-27B	KENNEDY OIL	551	410
P144741W	52	73	27	NWSE	CBNG	NORTH KITTY FEDERAL 33-27A	KENNEDY OIL		
P147681W	52	73	27	SWSE	CBNG	NORTH KITTY FEDERAL 34-27A	KENNEDY OIL	717	4001
P144737W 52		73	27	SESE	CBNG	NORTH KITTY FEREDAL 44-27B	KENNEDY OIL	733	530
P144742W 52		73	27	SESE	CBNG	NORTH KITTY FEDERAL 44-27A	KENNEDY OIL		
P145026W	52	73	34	SENW	CBNG	NORTH KITTY FEDERAL 22-34B	KENNEDY OIL	866	666
P144740W	52	73	34	SENW	CBNG	NORTH KITTY FEREDAL 22-34A	KENNEDY OIL	930	670
P67073W	52	73	35	NWNE	STO	VIDETA #1	TWENTY MILE LAND CO.	250	84
P109275W 52		73	35	NENW	STO,MIS,CBNG	TWENTY MILE 21C-3523	REDSTONE RESOURCES, INC.	662	242
P115523W 52		73	35	SWNW	STO,CBNG	TWENTY MILE 12C-3523	DEVON ENERGY PRODUCTION CO. L.P.	687	180
P116612W 52		73	35	NESW	STO,CBNG	TWENTY MILE 23C-3523	DEVON ENERGY PRODUCTION CO. L.P.	680	198
25/7/59W	52	73	36	NENE					

Appropriation	T	R	S	QQ	Permit Uses	Permit Facility Name	Permit Applicant	TD	SWL
25/3/59W	52	73	36	NENE					
25/5/59W	52	73	36	NENE					
25/4/59W	52	73	36	NENE					
25/6/59W	52	73	36	NENE					
25/2/59W	52	73	36	NENE					
P103612W 52		73	36	NENE	STO,MIS,CBNG	STATE #41A-3623	WYO BOARD OF LAND COMMISSIONERS** REDSTONE RESOURCES, INC	129.5 0	
P105074W 52		73	36	NWNE	STO,CBNG	STATE 31A-3623	WYO BOARD OF LAND COMMISSIONERS** REDSTONE RESOURCES, INC	426 177	
24/5/260W	52	73	36	SWNE					
P104527W 52		73	36	SENE	STO,MIS,CBNG	STATE 42A-3623	REDSTONE RESOURCES, INC	1283	0
25/4/315W	52	73	36	SENE					
P40771W 52		73	36	SENE	MON	RCH 2A	WY BOARD OF LAND COMMISSIONERS** THUNDER BASIN COAL COMPANY	422 51	
P106780W 52		73	36	SENE	STO,MIS,CBNG	STATE 42C-3623	WYO BOARD OF LAND COMMISSIONERS** REDSTONE RESOURCES, INC	408 -1	
P40772W 52		73	36	SENE	MON	RCH 2B	WY BOARD OF LAND COMMISSIONERS** THUNDER BASIN COAL COMPANY	33 24.5	
25/3/315W	52	73	36	SENE					
P107927W 52		73	36	NENW	STO,MIS,CBNG	STATE 21C-3623	WYO BOARD OF LAND COMMISSIONERS** REDSTONE RESOURCES, INC	491 216	
P131326W 52		73	36	NENW	CBNG	STATE 21D-3623	WY STATE BOARD OF LAND COMMISSIONERS** REDSTONE RESOURCES INC.	1351 823	
25/12/297W	52	73	36	NWNW					
25/2/298W	52	73	36	NWNW					
25/3/298W	52	73	36	NWNW					
25/1/298W	52	73	36	NWNW					

Appropriation	T	R	S	QQ	Permit Uses	Permit Facility Name	Permit Applicant	TD	SWL
P106635W	52	73	36	NWNW	STO,CBNG	STATE 11C-3623	REDSTONE RESOURCES, INC	500	203
P105072W	52	73	36	SENW	STO,CBNG	STATE 22EC-3623	WYO BOARD OF LAND COMMISSIONERS** REDSTONE RESOURCES, INC	459 171	
P105071W 52		73	36	NWSW	STO,CBNG	STATE 13EA-3623	WYO BOARD OF LAND COMMISSIONERS** REDSTONE RESOURCES, INC	508 159	
25/9/169W	52	73	36	NWSW					
25/10/169W	52	73	36	NWSW					
25/11/169W	52	73	36	NWSW					
P161012W 52		73	36	SWSW	CBNG	STATE 14A-3623	MAJESTIC PETROLEUM OPERATIONS, LLC** WY STATE BOARD OF LAND COMMISSIONERS	218 170	
P40769W 52		73	36	SWSW	MON	RCH 1B	WY BOARD OF LAND COMMISSIONERS** THUNDER BASIN COAL COMPANY	130 70	
P40767W 52		73	36	SWSW	MON	RCH 1	WY BOARD OF LAND COMMISSIONERS** THUNDER BASIN COAL COMPANY	552 70	
P40768W 52		73	36	SWSW	MON	RCH 1A	WY BOARD OF LAND COMMISSIONERS** THUNDER BASIN COAL COMPANY	227 70	
P111702W	52	73	36	SESW	STO, CBNG	State 24C-3623	WYO BOARD OF LAND COMMISSIONERS** REDSTONE RESOURCES, INC.	461 298	
P105073W 52		73	36	NESE	STO,CBNG	STATE 43A-3623	WYO BOARD OF LAND COMMISSIONERS** REDSTONE RESOURCES, INC	516 135	
P106640W 52		73	36	NWSE	STO,CBNG	STATE 33C-3623	WYO BOARD OF LAND COMMISSIONERS** REDSTONE RESOURCES, INC	428 156	
25/3/304W	52	73	36	NWSE					
P105076W 52		73	36	SESE	STO,MIS,CBNG	STATE 44A-3623	WYO BOARD OF LAND COMMISSIONERS** REDSTONE RESOURCES, INC	422 129	
P18183P 51		72	5	SENE	DOM,STO	JOHN #1	GILBERT OEDEKOVEN	450	150
P128642W	51	72	5	SWSW	CBNG	RAWHIDE 13-5	Medallion Exploration	240	135
P129239W 51		72	5	SESW	CBNG RAWHIDE	14-5	Medallion Exploration	210	100

Appropriation	T	R	S	QQ	Permit Uses	Permit Facility Name	Permit Applicant	TD	SWL
P103472W 51		72	6	NENW	STO,MIS,CBNG	CABALLO #21C-612	REDSTONE RESOURCES, INC	111	-1
P108927W 51		72	6	NENW	STO,MIS,CBNG	CABALLO 21C-612	DEVON ENERGY CORP. (NEVADA)	378	240
39/2/414W 51		72	6	NWNW	STO,MIS	CABALLO FEDERAL TFU 11C-612	DEVON ENERGY PRODUCTION CO. L.P.		
P110782W 51		72	6	NWNW	STO,CBNG	Caballo Fed. TFU 11C-612	DEVON ENERGY CORP.	358	34
P104713W 51		72	6	SENW	STO,CBNG	CABALLO 22C-612	DEVON ENERGY CORP. (NEVADA)	322	0
P110870W	51	72	6	NWSW	STO,CBNG	Caballo State TFU 13C-612	WY STATE BOARD OF LAND COMMISSIONERS** DEVON ENERGY CORP.	331 44	
P126815W 51		72	6	NWSW	CBNG	CABALLO STATE TFU 13A-612	DEVON ENERGY PRODUCTION CO. L.P.** CABALLO COAL COMPANY	331 44	
P111284W 51		72	6	SWSE	STO,CBNG	Caballo TFU 34C-612	DEVON ENERGY CORP.	264	97
25/8/162W	51	72	6	SESE					
25/9/162W	51	72	6	SESE					
39/8/413W 51		73	1	NWNE	STO,MIS	CABALLO TFU 31C-113	DEVON ENERGY PRODUCTION CO. L.P.		
P110786W 51		73	1	NWNE	STO,CBNG	Caballo Fed. TFU 31C-113	DEVON ENERGY CORP.	437	63
39/1/414W 51		73	1	SENE	STO,MIS	CABALLO TFU 42C-113	DEVON ENERGY PRODUCTION CO. L.P.		
P110783W 51		73	1	SENE	STO,CBNG	Caballo Fed. TFU 42C-113	DEVON ENERGY CORP.	422	40
39/9/412W 51		73	1	NWSW	STO,MIS	20 MILE 13C-113	DEVON ENERGY PRODUCTION CO. L.P.		
P131325W	51	73	1	NWSW	STO,CBNG	20 MILE 23A-1313	20 MILE LAND COMPANY** DEVON ENERGY PRODUCTION CO. L.P.	264 139	
P110806W	51	73	1	NWSW	STO,CBNG	20 Mile TFU 13C-1413	DEVON ENERGY PRODUCTION CO. L.P.	533	42
P120554W	51	73	1	SESW	STO,CBNG	20 Mile 24C-113	JOHN DALY** DEVON ENERGY PRODUCTION CO. L.P.	448 330	
P120555W	51	73	1	SESW	STO,CBNG	20 Mile 24A-113	JOHN DALY** DEVON ENERGY PRODUCTION CO. L.P.	214 25	
P108420W 51		73	1	SESE	STO,CBNG	CABALLO FEDERAL 44C-113	DEVON ENERGY PRODUCTION COMPANY, L.P.	377	61
P110785W 51		73	1	SESE	STO,CBNG	Caballo Fed. TFU 44C-113	DEVON ENERGY CORP.	377	61

Appropriation	T	R	S	QQ	Permit Uses	Permit Facility Name	Permit Applicant	TD	SWL
39/9/413W 51		73	1	SESE	STO,MIS	CABALLO FEDERAL TFU 44C-113	DEVON ENERGY PRODUCTION CO. L.P.		
P120553W	51	73	2	NWNE	STO,CBNG	20 Mile 31A-213	JOHN DALY** DEVON ENERGY PRODUCTION CO. L.P.	420 40	
P120552W	51	73	2	NWNE	STO,CBNG	20 Mile 31C-213	JOHN DALY** DEVON ENERGY PRODUCTION CO. L.P.	679 40	
P120545W	51	73	2	SENE	STO,CBNG	20 Mile 42C-213	JOHN DALY** DEVON ENERGY PRODUCTION CO. L.P.	634 102	
P120546W	51	73	2	SENE	STO,CBNG	20 Mile 42A-213	JOHN DALY** DEVON ENERGY PRODUCTION CO. L.P.	290 38	
P120550W	51	73	2	NWSE	STO,CBNG	20 Mile 33C-213	JOHN DALY** DEVON ENERGY PRODUCTION CO. L.P.	634 222	
P120551W	51	73	2	NWSE	STO,CBNG	20 Mile 33A-213	JOHN DALY** DEVON ENERGY PRODUCTION CO. L.P.	340 14	

T = township; R = range; S = section; QQ = quarter-quarter; STO = stock; DOM = domestic; CBNG = coal bed natural gas; MON = monitoring; MIS/MISC = miscellaneous; IND = industrial; IRR = irrigation; RES = reservoir; OIL = oil refining/production; TEM = temporary filing; DRI = drilling; TD = total depth; SWL = static water level

[1] Points of use and coal company water rights are omitted

Table H-2. Surface Water Rights within 3 Miles of the General Analysis Area

Appropriation	T	R	S	QQ	Status	Permit Uses	Permit Facility name	Permit Applicant	Permit Priority	Permit Source
P3788S	53	72	27	SWSW	UNA	STO	Lena Stock Reservoir	GILBERT OEDEKOVEN	06/28/1961	Box Elder Creek/Draw
P3787S	53	72	29	SWSE PU		STO	Gilbert Stock Reservoir	GILBERT OEDEKOVEN	06/28/1961	Gilbert Draw
P3787S	53	72	29	SESE	PU	STO	Gilbert Stock Reservoir	GILBERT OEDEKOVEN	06/28/1961	Gilbert Draw
31/2/78S	53	72	30	SENW	UNA	STO	Lynde #3 Stock Reservoir	Richard M. Lynde** Redstone Resources	04/19/2002	
31/3/78S	53	72	30	SWSW	UNA	STO	Lynde #4 Stock Reservoir	Richard M. Lynde** Redstone Resources	04/19/2002	
31/4/78S	53	72	30	SESW	UNA	STO	Lynde #5 Stock Reservoir	Richard M. Lynde** Redstone Resources	04/19/2002	
CR7/053A	53	72	30	SWSE	PU	STO	Calf Creek No. 2 Stock Reservoir	William A. Landeck	09/07/1971	Calf Creek Draw
CR7/053A	53	72	30	SWSE	PUO	STO	Calf Creek No. 2 Stock Reservoir	William A. Landeck	09/07/1971	Calf Creek Draw
P7139S	53	72	30	SWSE	PU	STO	Calf Creek No. 2 Stock Reservoir	WILLIAM A. LANDECK	09/07/1971	Calf Creek Draw
P7139S	53	72	30	SWSE	PUO	STO	Calf Creek No. 2 Stock Reservoir	WILLIAM A. LANDECK	09/07/1971	Calf Creek Draw
P16627S	53	72	31		UNA	STO	Lynde #6 Stock Reservoir	Devon Energy Prod. Co.**Richard & Judy Lynde	12/04/2001	Hanna Gulch
CR7/058A	53	72	31	NWSW	PU	STO	Spangler Stock Reservoir	William A. Landeck	09/07/1971	East Branch Spangler Draw
CR7/058A	53	72	31	NWSW	PUO	STO	Spangler Stock Reservoir	William A. Landeck	09/07/1971	East Branch Spangler Draw
P7137S	53	72	31	NWSW	PU	STO	Spangler Stock Reservoir	WILLIAM A. LANDECK	09/07/1971	East Branch Spangler Draw
P7137S	53	72	31	NWSW	PUO	STO	Spangler Stock Reservoir	WILLIAM A. LANDECK	09/07/1971	East Branch Spangler Draw
CR7/058A	53	72	31	SWSW	PU	STO	Spangler Stock Reservoir	William A. Landeck	09/07/1971	East Branch Spangler Draw
P7137S	53	72	31	SWSW	PU	STO	Spangler Stock Reservoir	WILLIAM A. LANDECK	09/07/1971	East Branch Spangler Draw
P15427S	53	72	32		UNA	STO	Oedekoven 3232 Stock Reservoir	Byron F. Oedekoven	04/25/2002	Corner Draw

Appropriation	T	R	S	QQ	Status	Permit Uses	Permit Facility name	Permit Applicant	Permit Priority	Permit Source
P1543S	53	72	33	SWNE	UNA	STO	Tharp Stock Reservoir	FLOYD A THARP	08/27/1956	Box Elder Creek/Draw
P26613D	53	72	34	NWNE	DSC	OIL,TEM, IND,DRI	Orcus #1 Water Haul	DAVIS OIL COMPANY	06/06/1980	Little Powder River
P26613D	53	72	34	NWNE	PU	OIL,TEM, IND,DRI	Orcus #1 Water Haul	DAVIS OIL COMPANY	06/06/1980	Little Powder River
CR7/495A	53	72	34	NENW	PU	STO	Corner Stock Reservoir	D. C. Holler	05/15/1974	Corner Draw
CR7/495A	53	72	34	NENW	PUO	STO	Corner Stock Reservoir	D. C. Holler	05/15/1974	Corner Draw
P7712S	53	72	34	NENW	PU	STO	Corner Stock Reservoir	D. C. HOLLER	05/15/1974	Corner Draw
P7712S	53	72	34	NENW	PUO	STO	Corner Stock Reservoir	D. C. HOLLER	05/15/1974	Corner Draw
P6169S	53	72	34	SWSE	PU	STO	Coal Mine Stock Reservoir	JUNE C. BOISSONNAS**D.C. HOLLER	04/30/1968	June Draw
P6169S	53	72	34	SWSE	PUO	STO	Coal Mine Stock Reservoir	JUNE C. BOISSONNAS**D.C. HOLLER	04/30/1968	June Draw
P29316D	53	72	35	SWNE	PU	OIL,TEM, IND,DRI	Royal Federal 35-7 Water Haul	CONLEY P. SMITH	02/24/1986	COAL MINE DRAW
P29316D	53	72	35	NESW	PUD	OIL,TEM, IND,DRI	Royal Federal 35-7 Water Haul	CONLEY P. SMITH	02/24/1986	COAL MINE DRAW
P6170S	53	72	35	SWSE	PU	STO	Adon Stock Reservoir	JUNE C. BOISSONNAS**D.C. HOLLER	04/30/1968	COAL MINE DRAW
P6170S	53	72	35	SWSE	PUO	STO	Adon Stock Reservoir	JUNE C. BOISSONNAS**D.C. HOLLER	04/30/1968	COAL MINE DRAW
P6012S	53	73	35	NWSE	PU	STO	Landik Draw Stock Reservoir	DEAN W. HALL	07/31/1967	Landik Draw
P6012S	53	73	35	NWSE	PUO	STO	Landik Draw Stock Reservoir	DEAN W. HALL	07/31/1967	Landik Draw
P155501S	53	73	36	SESW	UNA	STO	Hall - Tate #3 Stock Reservoir Devon	Energy Production Company, L.P** WY STATE LANDS & INVESTMENTS**David and Rhoda Tate	09/07/2001	Haleakala Gulch
P27039D	52	72	2	NENE	DSC	OIL,TEM, IND,DRI	Coquina Oil Water Pump	COQUINA OIL CORPORATION	03/16/1981	Little Powder River

Appropriation	T	R	S	QQ	Status	Permit Uses	Permit Facility name	Permit Applicant	Permit Priority	Permit Source
P27039D	52	72	2	NENE	PU	OIL,TEM, IND,DRI	Coquina Oil Water Pump	COQUINA OIL CORPORATION	03/16/1981	Little Powder River
P14107D	52	72	3	SWSW	PUD	IRR	Gatch Ditch	EDNA N. GATCH	05/10/1916	Gatch Creek
P15427S	52	72	5	NENW	UNA	STO	Oedekoven 3232 Stock Reservoir	Byron F. Oedekoven	04/25/2002	Corner Draw
P3107S	52	72	5	SENW	PU	STO	Corner Stock Reservoir	GILBERT OEDEKOVEN	02/25/1960	Corner Draw
P3107S	52	72	5	SENW	PUO	STO	Corner Stock Reservoir	GILBERT OEDEKOVEN	02/25/1960	Corner Draw
CR7/054A	52	72	6	SWNE	PU	STO	Calf Creek No. 3 Stock Reservoir	William A. Landeck	09/07/1971	Calf Creek Draw
CR7/054A	52	72	6	SWNE	PUO	STO	Calf Creek No. 3 Stock Reservoir	William A. Landeck	09/07/1971	Calf Creek Draw
P7140S	52	72	6	SWNE	PU	STO	Calf Creek No. 3 Stock Reservoir	WILLIAM A. LANDECK	09/07/1971	Calf Creek Draw
P7140S	52	72	6	SWNE	PUO	STO	Calf Creek No. 3 Stock Reservoir	WILLIAM A. LANDECK	09/07/1971	Calf Creek Draw
P17750S	52	72	6	NESW	UNA	STO	Franklin #4 Stock Reservoir	Byron F. Oedekoven	04/25/2002	Golden Draw
P18348S	52	72	7	NENW	UNA	STO	Lingle #4 Stock Reservoir	Byron F. Oedekoven	01/19/2001	Main Branch Hay Creek
P18348S	52	72	7	NWNW	UNA	STO	Lingle #4 Stock Reservoir	Byron F. Oedekoven	01/19/2001	Main Branch Hay Creek
P18348S	52	72	7	SWNW	UNA	STO	Lingle #4 Stock Reservoir	Byron F. Oedekoven	01/19/2001	Main Branch Hay Creek
P18348S	52	72	7	SENW	UNA	STO	Lingle #4 Stock Reservoir	Byron F. Oedekoven	01/19/2001	Main Branch Hay Creek
P18347S	52	72	7	NESW	UNA	STO	Lingle #2 Stock Reservoir	Byron F. Oedekoven	01/19/2001	9-7 Draw
P18346S	52	72	7	NESW	UNA	STO	Lingle #1 Stock Reservoir	Byron F. Oedekoven	01/19/2001	BFO Draw
31/4/82S	52	72	8	SWNE	UNA	STO	Oedy #2 Stock Reservoir	BYRON F OEDEKOVEN** Redstone Resources	04/25/2002	
P14105D	52	72	9	NESE	PUD	IRR	West Ditch	EDNA N. GATCH	05/10/1916	West Creek
P14108D	52	72	10	SWNE	PUD	IRR	Supplemental Ditch	EDNA N. GATCH	05/10/1916	EAST CREEK
C23/044A	52	72	10	SWSW	ADJ	IRR	Grant No. 1 Ditch	John J. Grant	08/12/1905	Springs

Appropriation	T	R	S	QQ	Status	Permit Uses	Permit Facility name	Permit Applicant	Permit Priority	Permit Source
C23/045A	52	72	10	SWSW	PUD	IRR	Grant No. 2 Ditch	John J. Grant	08/12/1905	Springs
C23/045A	52	72	10	SWSW	ADJ	IRR	Grant No. 2 Ditch	John J. Grant	08/12/1905	Springs
P6856D	52	72	10	SWSW	ADJ	IRR	Grant No. 2 Ditch	JOHN J. GRANT	08/12/1905	Springs
P6855D	52	72	10	SWSW	ADJ	IRR	Grant No. 1 Ditch	JOHN J. GRANT	08/12/1905	Springs
C13/044A	52	72	11	NWSE	ADJ	IRR	Preston Ditch	Mike Elmore	9/6/1890	Little Powder River
C13/044A	52	72	11	SWSE	ADJ	IRR	Preston Ditch	Mike Elmore	9/6/1890	Little Powder River
C13/044A	52	72	11	SESE	ADJ	IRR	Preston Ditch	Mike Elmore	9/6/1890	Little Powder River
C37/363A	52	72	12	NWNW	PU	IRR,RES	Bull Creek Reservoir	W. J. Monnett	05/19/1914	Bull Creek
C37/363A	52	72	12	NWNW	PUO	IRR,RES	Bull Creek Reservoir	W. J. Monnett	05/19/1914	Bull Creek
C37/364A	52	72	12	NWNW	PUD	IRR,RES	Monnett Ditch	W. J. Monnett	05/19/1914	Bull Creek
C38/234A	52	72	12	NWNW	PUD	IRR	Monnett Ditch	W. J. Monnett	05/19/1914	Bull Creek
P2658R	52	72	12	NWNW	ADJ	IRR,DOM	Bull Creek Reservoir	WALTER J. MONNETT	05/19/1914	Bull Creek
P12415D	52	72	12	NWNW	ADJ	IRR,DOM	Monnett Ditch	WALTER J. MONNETT	05/19/1914	Bull Creek
C38/234A	52	72	12	NWSW	ADJ	IRR	Monnett Ditch	W. J. Monnett	05/19/1914	Bull Creek
P21266D	52	72	12	NWSW	PUD	IRR	Wood No. 1 Sprinkler Irrigation System	ROBERT M. & GEORGIA MARY C. WOOD	08/27/1953	Little Powder River
P21266D	52	72	12	NWSW	DSC	IRR	Wood No. 1 Sprinkler Irrigation System	ROBERT M. & GEORGIA MARY C. WOOD	08/27/1953	Little Powder River
P12415D	52	72	12	NWSW	ADJ	IRR,DOM	Monnett Ditch	WALTER J. MONNETT	05/19/1914	Bull Creek
C13/044A	52	72	14	NENE	ADJ	IRR	Preston Ditch	Mike Elmore	9/6/1890	Little Powder River
C13/044A	52	72	14	NWNE	ADJ	IRR	Preston Ditch	Mike Elmore	9/6/1890	Little Powder River
C13/044A	52	72	14	SWNE	ADJ	IRR	Preston Ditch	Mike Elmore	9/6/1890	Little Powder River
C13/044A	52	72	14	SENE	ADJ	IRR	Preston Ditch	Mike Elmore	9/6/1890	Little Powder River
C72/199A	52	72	14	SWNW	ADJ	IRR	P.L.R. Spreader System	D. C. Holler and Jane Holler, husband and wife	05/10/1974	Hay Creek

Appropriation	T	R	S	QQ	Status	Permit Uses	Permit Facility name	Permit Applicant	Permit Priority	Permit Source
P24338D	52	72	14	SWNW	ADJ	IRR	P.L.R. Spreader System	D. C. HOLLER	05/10/1974	Hay Creek
C13/044A	52	72	14	SENW	ADJ	IRR	Preston Ditch	Mike Elmore	9/6/1890	Little Powder River
C72/199A	52	72	14	SENW	ADJ	IRR	P.L.R. Spreader System	D. C. Holler and Jane Holler, husband and wife	05/10/1974	Hay Creek
C72/199A	52	72	14	SENW	ADJ	IRR	P.L.R. Spreader System	D. C. Holler and Jane Holler, husband and wife	05/10/1974	Hay Creek
C72/199A	52	72	14	SENW	PUD	IRR	P.L.R. Spreader System	D. C. Holler and Jane Holler, husband and wife	05/10/1974	Hay Creek
P24338D	52	72	14	SENW	PUD	IRR	P.L.R. Spreader System	D. C. HOLLER	05/10/1974	Hay Creek
P24338D	52	72	14	SENW	ADJ	IRR	P.L.R. Spreader System	D. C. HOLLER	05/10/1974	Hay Creek
P24338D	52	72	14	SENW	ADJ	IRR	P.L.R. Spreader System	D. C. HOLLER	05/10/1974	Hay Creek
C13/044A	52	72	14	NESW	ADJ	IRR	Preston Ditch	Mike Elmore	9/6/1890	Little Powder River
C72/199A	52	72	14	NESW	ADJ	IRR	P.L.R. Spreader System	D. C. Holler and Jane Holler, husband and wife	05/10/1974	Hay Creek
P24338D	52	72	14	NESW	ADJ	IRR	P.L.R. Spreader System	D. C. HOLLER	05/10/1974	Hay Creek
P24338D	52	72	14	NWSW	ADJ	IRR	P.L.R. Spreader System	D. C. HOLLER	05/10/1974	Hay Creek
C13/044A	52	72	14	N ESE	ADJ	IRR	Preston Ditch	Mike Elmore	9/6/1890	Little Powder River
P14204D	52	72	14	NESE	PUD	IRR	Ben Hur Ditch	BEN HUR STOCK FARM	01/13/1916	Corrall Creek
C13/044A	52	72	14	NWSE	ADJ	IRR	Preston Ditch	Mike Elmore	9/6/1890	Little Powder River
C13/044A	52	72	14	SWSE	ADJ	IRR	Preston Ditch	Mike Elmore	9/6/1890	Little Powder River
C13/044A	52	72	14	SESE	ADJ	IRR	Preston Ditch	Mike Elmore	9/6/1890	Little Powder River
C23/044A	52	72	15	NWNW	ADJ	IRR	Grant No. 1 Ditch	John J. Grant	08/12/1905	Springs
C23/045A	52	72	15	NWNW	ADJ	IRR	Grant No. 2 Ditch	John J. Grant	08/12/1905	Springs
P6856D	52	72	15	NWNW	ADJ	IRR	Grant No. 2 Ditch	JOHN J. GRANT	08/12/1905	Springs
P6855D	52	72	15	NWNW	ADJ	IRR	Grant No. 1 Ditch	JOHN J. GRANT	08/12/1905	Springs
P11599R	52	72	16	SENW	UNA	IND	Sedimentation No. 33 Reservoir	TRITON COAL COMPANY** WY State Lands & Investments	07/21/2003	Main Branch Hay Creek

Appropriation	T	R	S	QQ	Status	Permit Uses	Permit Facility name	Permit Applicant	Permit Priority	Permit Source
P11598R	52	72	16	SWSE	UNA	IND	Sedimentation No. 34 Reservoir	TRITON COAL COMPANY** WY State Lands & Investments	07/21/2003	Hay Creek
P11602R	52	72	18	SENE	UNA	IND	Hay Creek Blocking Dike Reservoir	Triton Coal Co.** Wyo State Office of Lands & Investments	07/21/2003	Main Branch Hay Creek
P11602R	52	72	18	SENE	UNA	IND	Hay Creek Blocking Dike Reservoir	Triton Coal Co.** Wyo State Office of Lands & Investments	07/21/2003	Main Branch Hay Creek
31/1/11S	52	72	18	NENW	UNA	STO	Franklin #1 Stock Reservoir	Redstone Resources, Inc.**BYRON F OEDEKOVEN	12/04/2001	
31/5/82S	52	72	18	NWSW	UNA	STO	FRANKLIN #2 STOCK RESERVOIR	BYRON F OEDEKOVEN** Redstone Resources	04/25/2002	
30/5/223S	52	72	19	NWNW		STO	Z-24 #2 Stock Reservoir	Byron F. Oedekoven	01/19/2001	
C34/176A	52	72	20	SENE	PU	IRR,DOM	Grant Reservoir	John J. Grant	06/12/1909	Hay Creek
P24874D	52	72	20	SESE	PUD	OIL,TEM, IND,DRI	C & K Petroleum, Inc. Oil Well Pump Point	C & K PETROLEUM, INC.	10/29/1975	C & K Spring
C34/177A	52	72	21	NWNE	ADJ	IRR,DOM	Grant Ditch	John J. Grant	06/12/1909	Hay Creek
P11598R	52	72	21	NWNE	UNA	IND	Sedimentation No. 34 Reservoir	TRITON COAL COMPANY** WY State Lands & Investments	07/21/2003	Hay Creek
C34/177A	52	72	21	NENW	ADJ	IRR,DOM	Grant Ditch	John J. Grant	06/12/1909	Hay Creek
C34/177A	52	72	21	NWNW	ADJ	IRR,DOM	Grant Ditch	John J. Grant	06/12/1909	Hay Creek
C34/176A	52	72	21	SWNW	PU	IRR,DOM	Grant Reservoir	John J. Grant	06/12/1909	Hay Creek
C34/176A	52	72	21	SWNW	PUO	IRR,DOM	Grant Reservoir	John J. Grant	06/12/1909	Hay Creek
C34/177A	52	72	21	SWNW	ADJ	IRR,DOM	Grant Ditch	John J. Grant	06/12/1909	Hay Creek
C34/177A	52	72	21	SWNW	PUD	IRR,DOM	Grant Ditch	John J. Grant	06/12/1909	Hay Creek
C34/177A	52	72	21	SENW	ADJ	IRR,DOM	Grant Ditch	John J. Grant	06/12/1909	Hay Creek
P24874D	52	72	21	SWSW	PU	OIL,TEM, IND,DRI	C & K Petroleum, Inc. Oil Well Pump Point	C & K PETROLEUM, INC.	10/29/1975	C & K Spring

Appropriation	T	R	S	QQ	Status	Permit Uses	Permit Facility name	Permit Applicant	Permit Priority	Permit Source
P24874D	52	72	21	SWSW	DSC	OIL,TEM, IND,DRI	C & K Petroleum, Inc. Oil Well Pump Point	C & K PETROLEUM, INC.	10/29/1975	C & K Spring
C13/044A	52	72	23	NENE	ADJ	IRR	Preston Ditch	Mike Elmore	9/6/1890	Little Powder River
C13/044A	52	72	23	NWNE	ADJ	IRR	Preston Ditch	Mike Elmore	9/6/1890	Little Powder River
C34/179A	52	72	23	SWNE	ADJ	IRR	Raw-Hide Ditch	Mrs. Lydia H. Elmore	09/20/1905	Rawhide Creek
P6887D	52	72	23	SWNE	UNA	RES,IRR	Raw-Hide Ditch	MIKE ELMORE	09/20/1905	Rawhide Creek
C13/044A	52	72	23	SENE	ADJ	IRR	Preston Ditch	Mike Elmore	9/6/1890	Little Powder River
C13/044A	52	72	23	NENW	ADJ	IRR	Preston Ditch	Mike Elmore	9/6/1890	Little Powder River
C34/179A	52	72	23	SENW	ADJ	IRR	Raw-Hide Ditch	Mrs. Lydia H. Elmore	09/20/1905	Rawhide Creek
P6887D	52	72	23	SENW	UNA	RES,IRR	Raw-Hide Ditch	MIKE ELMORE	09/20/1905	Rawhide Creek
C34/179A	52	72	23	NESW	ADJ	IRR	Raw-Hide Ditch	Mrs. Lydia H. Elmore	09/20/1905	Rawhide Creek
P6887D	52	72	23	NESW	UNA	RES,IRR	Raw-Hide Ditch	MIKE ELMORE	09/20/1905	Rawhide Creek
C34/179A	52	72	23	SESW	ADJ	IRR	Raw-Hide Ditch	Mrs. Lydia H. Elmore	09/20/1905	Rawhide Creek
P6887D	52	72	23	SESW	UNA	RES,IRR	Raw-Hide Ditch	MIKE ELMORE	09/20/1905	Rawhide Creek
C13/044A	52	72	23	N ESE	ADJ	IRR	Preston Ditch	Mike Elmore	9/6/1890	Little Powder River
C34/179A	52	72	23	NESE	ADJ	IRR	Raw-Hide Ditch	Mrs. Lydia H. Elmore	09/20/1905	Rawhide Creek
P6887D	52	72	23	NESE	UNA	RES,IRR	Raw-Hide Ditch	MIKE ELMORE	09/20/1905	Rawhide Creek
C34/179A	52	72	23	NWSE	ADJ	IRR	Raw-Hide Ditch	Mrs. Lydia H. Elmore	09/20/1905	Rawhide Creek
P6887D	52	72	23	NWSE	UNA	RES,IRR	Raw-Hide Ditch	MIKE ELMORE	09/20/1905	Rawhide Creek
C34/179A	52	72	23	SWSE	ADJ	IRR	Raw-Hide Ditch	Mrs. Lydia H. Elmore	09/20/1905	Rawhide Creek
P6887D	52	72	23	SWSE	UNA	RES,IRR	Raw-Hide Ditch	MIKE ELMORE	09/20/1905	Rawhide Creek
C13/044A	52	72	23	SESE	ADJ	IRR	Preston Ditch	Mike Elmore	9/6/1890	Little Powder River
C34/179A	52	72	23	SESE	ADJ	IRR	Raw-Hide Ditch	Mrs. Lydia H. Elmore	09/20/1905	Rawhide Creek

Appropriation	T	R	S	QQ	Status	Permit Uses	Permit Facility name	Permit Applicant	Permit Priority	Permit Source
C13/044A	52	72	26	NENE	ADJ	IRR	Preston Ditch	Mike Elmore	9/6/1890	Little Powder River
C13/044A	52	72	26	NWNE	ADJ	IRR	Preston Ditch	Mike Elmore	9/6/1890	Little Powder River
C34/179A	52	72	26	NWNE	ADJ	IRR	Raw-Hide Ditch	Mrs. Lydia H. Elmore	09/20/1905	Rawhide Creek
P6887D	52	72	26	NWNE	UNA	RES,IRR	Raw-Hide Ditch	MIKE ELMORE	09/20/1905	Rawhide Creek
C13/044A	52	72	26	SWNE	ADJ	IRR	Preston Ditch	Mike Elmore	9/6/1890	Little Powder River
C34/179A	52	72	26	SWNE	ADJ	IRR	Raw-Hide Ditch	Mrs. Lydia H. Elmore	09/20/1905	Rawhide Creek
P6887D	52	72	26	SWNE	UNA	RES,IRR	Raw-Hide Ditch	MIKE ELMORE	09/20/1905	Rawhide Creek
C34/179A	52	72	26	NENW	ADJ	IRR	Raw-Hide Ditch	Mrs. Lydia H. Elmore	09/20/1905	Rawhide Creek
P6887D	52	72	26	NENW	UNA	RES,IRR	Raw-Hide Ditch	MIKE ELMORE	09/20/1905	Rawhide Creek
C34/179A	52	72	26	SWNW	ADJ	IRR	Raw-Hide Ditch	Mrs. Lydia H. Elmore	09/20/1905	Rawhide Creek
P6887D	52	72	26	SWNW	UNA	RES,IRR	Raw-Hide Ditch	MIKE ELMORE	09/20/1905	Rawhide Creek
C34/179A	52	72	26	SENW	ADJ	IRR	Raw-Hide Ditch	Mrs. Lydia H. Elmore	09/20/1905	Rawhide Creek
P6887D	52	72	26	SENW	UNA	RES,IRR	Raw-Hide Ditch	MIKE ELMORE	09/20/1905	Rawhide Creek
C34/179A	52	72	26	NWSW	ADJ	IRR	Raw-Hide Ditch	Mrs. Lydia H. Elmore	09/20/1905	Rawhide Creek
P6887D	52	72	26	NWSW	UNA	RES,IRR	Raw-Hide Ditch	MIKE ELMORE	09/20/1905	Rawhide Creek
P6758S	52	72	27	NENW	PU	STO	South Pines Stock Reservoir	CHARLES R. OEDEKOVEN	07/24/1970	South Pines Draw
P6758S	52	72	27	NENW	PUO	STO	South Pines Stock Reservoir	CHARLES R. OEDEKOVEN	07/24/1970	South Pines Draw
C38/038A	52	72	27	SESE	ADJ	IRR	Rawhide Ditch {Enl. of}	Lydia H. Elmore	06/01/1914	Rawhide Creek
C38/043A	52	72	27	SESE	ADJ	IRR	Rawhide Ditch No. 2	Lydia H. Elmore	06/01/1914	Rawhide Creek
P12472D	52	72	27	SESE	ADJ	IRR	Rawhide Ditch No. 2	LYDIA H. ELMORE	06/01/1914	Rawhide Creek
P2971E	52	72	27	SESE	ADJ	IRR	Rawhide Ditch {Enl. of}	LYDIA H. ELMORE	06/01/1914	Rawhide Creek
P12410R	52	72	31		UNA	STO	Triton No. 1 Reservoir	Quantum Energy/Blackstone	12/28/2005	Living Water Draw
P12410R	52	72	31	NESW	UNA	STO	Triton No. 1 Reservoir	Quantum Energy/Blackstone	12/28/2005	Living Water Draw

Appropriation	T	R	S	QQ	Status	Permit Uses	Permit Facility name	Permit Applicant	Permit Priority	Permit Source
P17232S	52	72	31	SWSW	UNA	STO	Joe LeFors Stock Reservoir	Twenty Mile Land Co., LLC	04/25/2002	Living Water Draw
P12410R	52	72	31	SESW	UNA	STO	Triton No. 1 Reservoir	Quantum Energy/Blackstone	12/28/2005	Living Water Draw
C36/250A	52	72	33	SENW	PUD	IRR	Road Ditch	Effie Rooney	05/24/1912	Road Draw
C36/250A	52	72	33	NWSW	ADJ	IRR	Road Ditch	Effie Rooney	05/24/1912	Road Draw
C34/182A	52	72	33	SWSW	PUD	IRR	Rough Ditch	William D. Rooney	05/24/1912	Rough Draw
P11276D	52	72	33	SWSE	PUD	IRR	Rough Ditch	WM. D. ROONEY	05/24/1912	Rough Draw
C38/043A	52	72	34	NENE	ADJ	IRR	Rawhide Ditch No. 2	Lydia H. Elmore	06/01/1914	Rawhide Creek
P12472D	52	72	34	NENE	ADJ	IRR	Rawhide Ditch No. 2	LYDIA H. ELMORE	06/01/1914	Rawhide Creek
C38/038A	52	72	34	NWNE	ADJ	IRR	Rawhide Ditch {Enl. of}	Lydia H. Elmore	06/01/1914	Rawhide Creek
P2971E	52	72	34	NWNE	ADJ	IRR	Rawhide Ditch {Enl. of}	LYDIA H. ELMORE	06/01/1914	Rawhide Creek
C34/178A	52	72	34	SWNE	PUO	IRR	Raw-Hide Reservoir	Mrs. Lydia H. Elmore	09/20/1905	Rawhide Creek
C34/178A	52	72	34	SWNE	PU	IRR	Raw-Hide Reservoir	Mrs. Lydia H. Elmore	09/20/1905	Rawhide Creek
C34/179A	52	72	34	SWNE	PUD	IRR	Raw-Hide Ditch	Mrs. Lydia H. Elmore	09/20/1905	Rawhide Creek
C38/038A	52	72	34	SWNE	PUD	IRR	Rawhide Ditch {Enl. of}	Lydia H. Elmore	06/01/1914	Rawhide Creek
C38/039A	52	72	34	SWNE	PUO	IRR	Rawhide Reservoir,, Enl.	Lydia H. Elmore	06/01/1914	Rawhide Creek
C38/039A	52	72	34	SWNE	PU	IRR	Rawhide Reservoir,, Enl.	Lydia H. Elmore	06/01/1914	Rawhide Creek
P734R	52	72	34	SWNE	PUO	IRR	Raw-Hide Reservoir	MIKE ELMORE	09/20/1905	Rawhide Creek
P734R	52	72	34	SWNE	PU	IRR	Raw-Hide Reservoir	MIKE ELMORE	09/20/1905	Rawhide Creek
P6887D	52	72	34	SWNE	PUD	RES,IRR	Raw-Hide Ditch	MIKE ELMORE	09/20/1905	Rawhide Creek
P2971E	52	72	34	SWNE	PUD	IRR	Rawhide Ditch {Enl. of}	LYDIA H. ELMORE	06/01/1914	Rawhide Creek
P2971E	52	72	34	SWNE	PUH	IRR	Rawhide Ditch {Enl. of}	LYDIA H. ELMORE	06/01/1914	Rawhide Creek
P2681R	52	72	34	SWNE	PU	IRR	Rawhide Reservoir, Enlarge	LYDIA H. ELMORE	06/01/1914	Rawhide Creek
P2681R	52	72	34	SWNE	PUO	IRR	Rawhide Reservoir, Enlarge	LYDIA H. ELMORE	06/01/1914	Rawhide Creek

Appropriation	T	R	S	QQ	Status	Permit Uses	Permit Facility name	Permit Applicant	Permit Priority	Permit Source
P15503S	52	73	1	SESE	UNA	STO	Hall-Tate #6 Stock Reservoir	David & Rhoda Tate** QUANTUM ENERGY	09/07/2001	Hulaman Gulch
P18370S	52	73	1		UNA	STO	Hall-Tate #4 Stock Reservoir	David & Rhoda Tate	09/13/2001	Aloha Draw
P6121S	52	73	1	SWNW	PU	STO	South Pasture Stock Reservoir	DEAN W. HALL	07/31/1967	Muman Draw
P6121S	52	73	1	SWNW	PUO	STO	South Pasture Stock Reservoir	DEAN W. HALL	07/31/1967	Muman Draw
P6121S	52	73	1	NESW	PU	STO	South Pasture Stock Reservoir	DEAN W. HALL	07/31/1967	Muman Draw
P6121S	52	73	1	NWSW	PU	STO	South Pasture Stock Reservoir	DEAN W. HALL	07/31/1967	Muman Draw
P16540S	52	73	2	SESE	UNA	STO	Redtail Stock Reservoir	David and Rhoda Tate** Redstone Resources	04/19/2002	Luow Gulch
P16540S	52	73	2	SWSE	UNA	STO	Redtail Stock Reservoir	David and Rhoda Tate** Redstone Resources	04/19/2002	Luow Gulch
P15431S	52	73	2	NENE	UNA	STO	Hall-Tate #7 Stock Reservoir	Devon Energy Production**David & Rhoda Tate	10/12/2001	Hall-Tate Draw
P15431S	52	73	2	NWNE	UNA	STO	Hall-Tate #7 Stock Reservoir	Devon Energy Production**David & Rhoda Tate	10/12/2001	Hall-Tate Draw
P18352S	52	73	3		UNA	STO	Soukup Draw PR-3 Stock Reservoir	William A. Paul & Elizabeth Landeck	02/12/2007	Will's Gulch
P16362S	52	73	3	SWSE	UNA	STO	Landeck #10 Stock Reservoir	Devon Energy Prod. Co.**William A. Landeck	04/19/2002	East McKay Draw
P16362S	52	73	3	NESE	UNA	STO	Landeck #10 Stock Reservoir	Devon Energy Prod. Co.**William A. Landeck	04/19/2002	East McKay Draw
CR7/063A	52	73	3	SWNE	PU	STO	McKay Stock Reservoir	William A. Landeck	09/07/1971	East McKay Draw
P7138S	52	73	3	SWNE	PU	STO	McKay Stock Reservoir	WILLIAM A. LANDECK	09/07/1971	East McKay Draw
P12795R	52	73	3	SWNE	UNA	STO	Enl of McKay Reservoir	William Landeck	09/13/2001	East McKay Draw
CR7/062A	52	73	3	NESW	PUO	STO	Robinson #1 Stock Reservoir	William A. Landeck	09/07/1971	West McKay Draw
CR7/062A	52	73	3	NESW	PU	STO	Robinson #1 Stock Reservoir	William A. Landeck	09/07/1971	West McKay Draw
P7136S	52	73	3	NESW	PU	STO	Robinson #1 Stock Reservoir	WILLIAM A. LANDECK	09/07/1971	West McKay Draw
P7136S	52	73	3	NESW	PUO	STO	Robinson #1 Stock Reservoir	WILLIAM A. LANDECK	09/07/1971	West McKay Draw
CR7/063A	52	73	3	NWSE	PU	STO	McKay Stock Reservoir	William A. Landeck	09/07/1971	East McKay Draw
CR7/063A	52	73	3	NWSE	PUO	STO	McKay Stock Reservoir	William A. Landeck	09/07/1971	East McKay Draw
P7138S	52	73	3	NWSE	PU	STO	McKay Stock Reservoir	WILLIAM A. LANDECK	09/07/1971	East McKay Draw

Appropriation	T	R	S	QQ	Status	Permit Uses	Permit Facility name	Permit Applicant	Permit Priority	Permit Source
P7138S	52	73	3	NWSE	PUO	STO	McKay Stock Reservoir	WILLIAM A. LANDECK	09/07/1971	East McKay Draw
P12795R	52	73	3	NWSE	UNA	STO	Enl of McKay Reservoir	William Landeck	09/13/2001	East McKay Draw
P16325S	52	73	10	NWNE	UNA	STO	Rosalie Kenney Stock Reservoir	Helen 1987 Trust Hinkes** Twenty Mile Land Co.	11/15/2002	Soakup Creek
P16325S	52	73	10	SENE	UNA	STO	Rosalie Kenney Stock Reservoir	Helen 1987 Trust Hinkes** Twenty Mile Land Co.	11/15/2002	Soakup Creek
P16325S	52	73	10	NENE	UNA	STO	Rosalie Kenney Stock Reservoir	Helen 1987 Trust Hinkes** Twenty Mile Land Co.	11/15/2002	Soakup Creek
P16363S	52	73	10	NWNE	UNA	STO	Landeck #11 Stock Reservoir	Devon Energy Prod. Co.**William A. Landeck	04/19/2002	Sponge Draw
P16363S	52	73	10	SWNE	UNA	STO	Landeck #11 Stock Reservoir	Devon Energy Prod. Co.**William A. Landeck	04/19/2002	Sponge Draw
P16482S	52	73	11	NESW	UNA	STO	Edward B. Kenny Stock Reservoir	Devon Energy Prod. Co.** Twenty Mile Land Co.	04/25/2002	Malachi Draw
P1168S	52	73	12	SESE	PU	STO	Lake Stock Reservoir	CECLE COOK	03/07/1955	Hay Creek Draw
P1168S	52	73	12	SESE	PUO	STO	Lake Stock Reservoir	CECLE COOK	03/07/1955	Hay Creek Draw
30/4/222S	52	73	12	SESE		STO	Cook #2 Stock Reservoir Cecle	Cook	01/19/2001	
CU9/110A	52	73	13	NWSW	ADJ	MISC	MOREL #1	Green Valley Estates Improvement and Service District	04/14/1993	
CU9/110A	52	73	13	SESW	ADJ	MISC	MOREL #1	Green Valley Estates Improvement and Service District	04/14/1993	
CU9/110A	52	73	13	NESW	ADJ	MISC	MOREL #1	Green Valley Estates Improvement and Service District	04/14/1993	
CU9/110A	52	73	13	SWSW	ADJ	MISC	MOREL #1	Green Valley Estates Improvement and Service District	04/14/1993	
CU9/110A	52	73	13	NWSW	ADJ	MISC	MOREL #1	Green Valley Estates Improvement and Service District	04/14/1993	
CU9/110A	52	73	13	SESW	ADJ	MISC	MOREL #1	Green Valley Estates Improvement and Service District	04/14/1993	
CU9/110A	52	73	13	NESW	ADJ	MISC	MOREL #1	Green Valley Estates Improvement and Service District	04/14/1993	

Appropriation	T	R	S	QQ	Status	Permit Uses	Permit Facility name	Permit Applicant	Permit Priority	Permit Source
CU9/110A	52	73	13	SWSW	ADJ	MISC	MOREL #1	Green Valley Estates Improvement and Service District	04/14/1993	
30/5/222S	52	73	13	SENE		STO	Cook #3 Stock Reservoir	Cecil Cook	01/19/2001	
P5468S	52	73	13	NWNW	PU	STO	Cook #2 Stock Reservoir	CECLE L. COOK	11/15/1965	Cook Draw
P5468S	52	73	13	NWNW	PUO	STO	Cook #2 Stock Reservoir	CECLE L. COOK	11/15/1965	Cook Draw
P17744S	52	73	13	NESW	UNA	STO	Oedy #1 Stock Reservoir	Byron F. Oedekoven	01/19/2001	Oedy Draw
P17744S	52	73	13	NESW	UNA	STO	Oedy #1 Stock Reservoir	Byron F. Oedekoven	01/19/2001	Oedy Draw
P16541S	52	73	14	SWNE	UNA	STO	Stanley A. Soukup #2 Stock Reservoir	Devon Energy Prod. Co.** Twenty Mile Land Co.	04/08/2002	Carlson Draw
P16541S	52	73	14	NWNE	UNA	STO	Stanley A. Soukup #2 Stock Reservoir	Devon Energy Prod. Co.** Twenty Mile Land Co.	04/08/2002	Carlson Draw
P16478S	52	73	15	NWNE	UNA	STO	Stanley A. Soukup Stock Reservoir	Devon Energy Prod. Co.** Twenty Mile Land Co.	04/25/2002	Soakup Creek
P16478S	52	73	15	SENE	UNA	STO	Stanley A. Soukup Stock Reservoir	Devon Energy Prod. Co.** Twenty Mile Land Co.	04/25/2002	Soakup Creek
P16478S	52	73	15	NENE	UNA	STO	Stanley A. Soukup Stock Reservoir	Devon Energy Prod. Co.** Twenty Mile Land Co.	04/25/2002	Soakup Creek
P16542S	52	73	22	NESE	UNA	STO	William R. Fox #1 Stock Reservoir	Devon Energy Prod. Co.** Twenty Mile Land Co.	05/09/2002	Squarepants Gulch
P16542S	52	73	22	NWSE	UNA	STO	William R. Fox #1 Stock Reservoir	Devon Energy Prod. Co.** Twenty Mile Land Co.	05/09/2002	Squarepants Gulch
P16479S	52	73	22	NENE	UNA	STO	Martin P. Carlson Stock Reservoir	Devon Energy Prod. Co.** Twenty Mile Land Co.	04/25/2002	Triton Draw
CU9/110A	52	73	23		ADJ	MISC	MOREL #1	Green Valley Estates Improvement and Service District	04/14/1993	
CU9/110A	52	73	23		ADJ	MISC	MOREL #1	Green Valley Estates Improvement and Service District	04/14/1993	
CU9/110A	52	73	23		ADJ	MISC	MOREL #1	Green Valley Estates Improvement and Service District	04/14/1993	
CU9/110A	52	73	23		ADJ	MISC	MOREL #1	Green Valley Estates Improvement and Service District	04/14/1993	

Appropriation	T	R	S	QQ	Status	Permit Uses	Permit Facility name	Permit Applicant	Permit Priority	Permit Source
CU9/110A	52	73	23		ADJ	MISC	MOREL #1	Green Valley Estates Improvement and Service District	04/14/1993	
CU9/110A	52	73	23		ADJ	MISC	MOREL #1	Green Valley Estates Improvement and Service District	04/14/1993	
CU9/110A	52	73	23		ADJ	MISC	MOREL #1	Green Valley Estates Improvement and Service District	04/14/1993	
CU9/110A	52	73	23		ADJ	MISC	MOREL #1	Green Valley Estates Improvement and Service District	04/14/1993	
CU9/110A	52	73	23		ADJ	MISC	MOREL #1	Green Valley Estates Improvement and Service District	04/14/1993	
CU9/110A	52	73	23		ADJ	MISC	MOREL #1	Green Valley Estates Improvement and Service District	04/14/1993	
CU9/110A	52	73	23		ADJ	MISC	MOREL #1	Green Valley Estates Improvement and Service District	04/14/1993	
CU9/110A	52	73	23		ADJ	MISC	MOREL #1	Green Valley Estates Improvement and Service District	04/14/1993	
CU9/110A	52	73	23		ADJ	MISC	MOREL #1	Green Valley Estates Improvement and Service District	04/14/1993	
P16479S	52	73	23	NWNW	UNA	STO	Martin P. Carlson Stock Reservoir	Devon Energy Prod. Co.** Twenty Mile Land Co.	04/25/2002	Triton Draw
CU9/110A	52	73	23	SWNE	ADJ	MISC	MOREL #1	Green Valley Estates Improvement and Service District	04/14/1993	
CU9/110A	52	73	23	SWNE	ADJ	MISC	MOREL #1	Green Valley Estates Improvement and Service District	04/14/1993	
CU9/110A	52	73	24	NENW	ADJ	MISC	MOREL #1	Green Valley Estates Improvement and Service District	04/14/1993	
CU9/110A	52	73	24	NENW	ADJ	MISC	MOREL #1	Green Valley Estates Improvement and Service District	04/14/1993	

Appropriation	T	R	S	QQ	Status	Permit Uses	Permit Facility name	Permit Applicant	Permit Priority	Permit Source
P17743S	52	7 3	2 4	NWNE	UNA	STO	Z-24 #3 Stock Reservoir	Byron F. Oedekoven** Quantum Energy/Blackstone	01/19/2001	Outer Draw
30/4/223S	52	73	24	NWSE		STO	Z-24 #1 Stock Reservoir	Byron F. Oedekoven	01/19/2001	
P17509S	52	73	26	NESW	UNA	STO	Bond Stock Reservoir	Calvin & Della Bond	05/09/2002	Kelley Draw
P3997S	52	73	26	NWSW	PU	STO	Kelley Stock Reservoir	HERMAN COLE	01/03/1962	Kelley Draw
P3997S	52	73	26	NWSW	PUO	STO	Kelley Stock Reservoir	HERMAN COLE	01/03/1962	Kelley Draw
P17231S	52	73	26	SESW	UNA	STO	John Schwartz #2 Stock Reservoir	Twenty Mile Land Co., LLC	04/25/2002	Kelley Draw
P18099S	52	73	27	NESW	UNA	STO	William R. Fox #2 Stock Reservoir	Twenty Mile Land Co., LLC	04/25/2002	Road Creek Prong of Wild Cat Creek
P16006S	52	73	34	SENE	UNA	STO	Ray T. Varah #1 Stock Reservoir	Devon Energy Production Co., LP** Twenty Mile Land Co.	04/25/2002	Isaiah Draw
P16006S	52	73	35	SWNW	UNA	STO	Ray T. Varah #1 Stock Reservoir	Devon Energy Production Co., LP** Twenty Mile Land Co.	04/25/2002	Isaiah Draw
P17231S	52	73	35	NWNE	UNA	STO	John Schwartz #2 Stock Reservoir	Twenty Mile Land Co., LLC	04/25/2002	Kelley Draw
P13241S	52	73	35	SWNE	UNA	STO	John Schwartz Stock Reservoir	TWENTY MILE LAND COMPANY	09/20/1999	J.S. Draw
P17231S	52	73	35	NENW	UNA	STO	John Schwartz #2 Stock Reservoir	Twenty Mile Land Co., LLC	04/25/2002	Kelley Draw
P17233S	52	73	35	SENW	UNA	STO	Ray T. Varah #2 Stock Reservoir	Twenty Mile Land Co., LLC	02/01/2002	J.S. Draw
P18478S	52	73	36	NESW	UNA	STO	Enl N.W. Chassell Reservoir (P1223R) Stock Reservoir	Twenty Mile Land Co.** Wyo State Office of Lands & Investments	09/08/2000	Sage Hen Draw
P13242S	52	73	36	NWSW	UNA	STO	Horse Pasture #2 Stock Reservoir	TWENTY MILE LAND COMPANY	09/20/1999	J.S. Draw
C29/389A	52	73	36	SESW	PU	STO	N. W. Chassell Reservoir	N. W. Chassell	03/07/1908	Sage Hen Draw
C29/389A	52	73	36	SESW	PUO	STO	N. W. Chassell Reservoir	N. W. Chassell	03/07/1908	Sage Hen Draw
P1223R	52	73	36	SESW	PU	STO,DOM	N. W. Chassell Reservoir	N. W. CHASSELL	03/07/1908	Sage Hen Draw
P1223R	52	73	36	SESW	PUO	STO,DOM	N. W. Chassell Reservoir	N. W. CHASSELL	03/07/1908	Sage Hen Draw
P18478S	52	73	36	NWSE	UNA	STO	Enl N.W. Chassell Reservoir (P1223R) Stock Reservoir	Twenty Mile Land Co.** Wyo State Office of Lands & Investments	09/08/2000	Sage Hen Draw

Appropriation	T	R	S	QQ	Status	Permit Uses	Permit Facility name	Permit Applicant	Permit Priority	Permit Source
P18478S	52	73	36	SWSE	UNA	STO	Enl N.W. Chassell Reservoir (P1223R) Stock Reservoir	Twenty Mile Land Co.** Wyo State Office of Lands & Investments	09/08/2000	Sage Hen Draw
C34/182A	51	72	3	NWNW	ADJ	IRR	Rough Ditch	William D. Rooney	05/24/1912	Rough Draw
P11276D	51	72	3	NWNW	ADJ	IRR	Rough Ditch	WM. D. ROONEY	05/24/1912	Rough Draw
C34/182A	51	72	4	NENE	ADJ	IRR	Rough Ditch	William D. Rooney	05/24/1912	Rough Draw
P11276D	51	72	4	NENE	ADJ	IRR	Rough Ditch	WM. D. ROONEY	05/24/1912	Rough Draw
C34/182A	51	72	4	NWNE	ADJ	IRR	Rough Ditch	William D. Rooney	05/24/1912	Rough Draw
P11276D	51	72	4	NWNE	ADJ	IRR	Rough Ditch	WM. D. ROONEY	05/24/1912	Rough Draw
CU2/553A	51	72	5	SENE	PU	STO	JOHN #2	Carter Oil Company	11/15/1972	
CU2/553A	51	72	5	SENE	PUW	STO	JOHN #2	Carter Oil Company	11/15/1972	
P17232S	51	72	6		UNA	STO	Joe LeFors Stock Reservoir	Twenty Mile Land Co., LLC	04/25/2002	Living Water Draw
P13752S	51	73	1	SWSW	UNA	STO	T51NR73W1SWSW Stock Reservoir	TWENTY MILE LAND COMPANY	01/27/2000	Board Draw
P13751S	51	73	2	NWNE	UNA	STO	T51NR73W2NWNE Stock Reservoir	TWENTY MILE LAND COMPANY	01/27/2000	Board Draw
P29316D	53	72	35	SWNE	DSC	OIL,TEM, IND,DRI	Royal Federal 35-7 Water Haul	CONLEY P. SMITH	02/24/1986	COAL MINE DRAW
C38/234A	52	72	12	NENW	ADJ	IRR	Monnett Ditch	W. J. Monnett	05/19/1914	Bull Creek
P12415D	52	72	12	NENW	ADJ	IRR,DOM	Monnett Ditch	WALTER J. MONNETT	05/19/1914	Bull Creek
C38/234A	52	72	12	SENW	ADJ	IRR	Monnett Ditch	W. J. Monnett	05/19/1914	Bull Creek
P21266D	52	72	12	SENW	PUD	IRR	Wood No. 1 Sprinkler Irrigation System	ROBERT M. & GEORGIA MARY C. WOOD	08/27/1953	Little Powder River
P12415D	52	72	12	SENW	ADJ	IRR,DOM	Monnett Ditch	WALTER J. MONNETT	05/19/1914	Bull Creek
C38/234A	52	72	12	NESW	ADJ	IRR	Monnett Ditch	W. J. Monnett	05/19/1914	Bull Creek
P12415D	52	72	12	NESW	ADJ	IRR,DOM	Monnett Ditch	WALTER J. MONNETT	05/19/1914	Bull Creek

T = township; R = range; S = section; QQ = quarter-quarter; UNA = unadjudicated; PU = location of well (not actual status); PUO = Point of reservoir outlet (not actual status); DSC = description; PUH/PUD = point of diversion/not actual status; ADJ = adjudication; PUW = Location of well (not actual status); STO = stock; DOM = domestic; CBNG = coal bed natural gas; MON = monitoring; MIS/MISC = miscellaneous; IND = industrial; IRR = irrigation; RES = reservoir; OIL = oil refining/production; TEM = temporary filing; DRI = drilling; TD = total depth; SWL = static water level

APPENDIX I
ENVIRONMENTAL QUALITY CONSULTING RESPECTIVE OF
HAY CREEK TRACT ALLUVIAL VALLEY FLOOR

APPENDIX I

ENVIRONMENTAL QUALITY COUNCIL RULING RESPECTIVE OF HAY CREEK TRACT AS AN ALLUVIAL VALLEY FLOOR

BEFORE THE ENVIRONMENTAL QUALITY COUNCIL
STATE OF WYOMING

FILED

FEB 14 2002

Terri A. Lorenzon, Director
Environmental Quality Council

IN THE MATTER OF	)	
TRITON COAL COMPANY, LLC,	)	
BUCKSKIN MINE,	)	Docket No. 01-4602
PERMIT NO. 500-T6, TFN 3 5/322	)	

APR 2002
Received
Dept. of Envir. Quality
Sheridan

ORDER

On September 17 and 18, 2001, the Environmental Quality Council ("Council") held a public hearing to reconsider a determination by the Department of Environmental Quality ("DEQ"), Land Quality Division ("LQD") that an alluvial valley floor, as defined by Wyo. Stat. 35-11-103(e)(xviii), exists on the Hay Creek Tract of the Buckskin Mine permit area, in Campbell County, near Gillette, Wyoming. Triton Coal Company, LLC, was represented by Edward W. Harris and Jerrold A. Long of Holland & Hart, and the DEQ was represented by John Burbridge, Assistant Attorney General. Council members present at the hearing were Robert Rawlings, Hearing Examiner, Thomas Dunn, Lisa Lindemann, Olin Sims, Jason Shogren, and Wendy Hutchinson. Also present for the Council was Terri A. Lorenzon, attorney for the Council.

On September 18, 2001, the Council, by a unanimous vote of the Council members, reached a decision in this matter. The Council hereby issues the following findings of fact and conclusions of law.

Findings of Fact

1. Triton Coal Company, LLC (Triton) owns and operates the Buckskin coal mine located in Campbell County, near Gillette, Wyoming.

2. On November 10, 2000, Triton applied for a permit amendment to extend the Buckskin Mine into the Hay Creek Tract. Prior to submitting that application, Triton requested a pre-application determination, pursuant to Wyoming Coal Rules and Regulations, Chap. 3, Section 2(a), of the presence of alluvial valley floors in the Hay Creek Tract.

3. After reviewing the material submitted by Triton with respect to the Hay Creek Tract, the LQD determined that 33.55 acres along Hay Creek constituted an alluvial valley floor (AVF).

4. Triton filed a petition with the Council on March 15, 2001, to review the decision of the LQD that 33.55 acres of AVF were present within Triton's mine permit area.

5. The Act defines an AVF as: " the unconsolidated stream laid deposits holding streams where water availability is sufficient for subirrigation or flood irrigation agricultural activities [.]" Wyo. Stat. § 35-11-1-3(c)(xviii).

6. The 33.55 acres determined by the LQD to constitute an AVF are underlain by unconsolidated stream laid deposits and sufficient water is present for subirrigation.

7. Regulations adopted by the LQD to implement the provisions of the Act define "subirrigation or flood irrigation agricultural activities" as follows:

> 'Subirrigation or flood irrigation agricultural activities' means the past and present *use* of any tract of land *for the successful production* of animal or vegetable life, *based on regional agricultural practices*, where *the use is enhanced or facilitated* by subirrigation or flood irrigation. These *uses include*, but are not limited to, the pasturing, *grazing*, and the cropping, cultivation, or harvesting *of agriculturally useful plants* whose production is enhanced or facilitated by the availability of water from subirrigation or flood irrigation. These uses do not include agricultural practices which do not benefit from the availability of water from subirrigation or flood irrigation.' (*emphasis added*)
>
> Wyoming Coal Rules and Regulations, Chapter 1, Section (co).

8. The 33.55 acres consist of riparian bottomland habitat, dominated by wetland plant species. The predominant plant species in this area are prairie cordgrass (*Spartina pectinata)*, common spikesedge (*Eleocharis palustris),* and American bulrush (*Scirpus pungens poly*). These plants provide poor to fair livestock forage while the vegetation in the upland and lowland prairie habitats provide forage of higher overall quality than that present in these riparian bottomlands.

9. The Hay Creek Tract consists of undeveloped rangeland, where the primary use is grazing cattle. The regional agricultural practice in the area is to place cattle in large fenced pastures that consist of upland and lowland prairie habitats, with access to small riparian areas to ensure water availability. The ranchers in this area do not attempt to specially manage the riparian areas separately from the other habitats.

10. Evidence shows cattle will over-utilize upland and lowland habitats before grazing the riparian plant species listed in paragraph 8 above. Therefore, based on past and present use of this land and regional agricultural practices, the riparian bottomland species are not agriculturally useful plants.

APR 2002
Received
Dept of Envir Quality
Sheridan

APPROVED JUN 13 '02

Conclusions of Law

1. Surface Coal mining in Wyoming is governed by the Wyoming Environmental Quality Act ("Act"). Wyo. Stat. § 35-11-101, *et seq.*

2. The Council has jurisdiction over the parties to and the subject matter of this proceeding. Wyo. Stat. § 35-11-112.

3. The Act requires surface coal mines to obtain permits from DEQ. Wyo. Stat. § 35-11-401(d).

4. The Act contains specific provisions and requirements with respect to areas called alluvial valley floors and the Council has adopted regulations governing alluvial valley floors. Wyo. Stat. §35-11-103(e)(viii); Wyoming Coal Rules and Regulations, Chapt. 1, Section 2(co) and Chapt. 3, Section 2.

5. For a streambed to be designated an alluvial valley floor, it must contain three components: First, the streambed in question must overlie unconsolidated stream laid deposits. Second, there must be sufficient water to provide for flood irrigation or subirrigation. Finally, that flood irrigation or subirrigation must enhance or facilitate past or present use, based on regional agricultural practices.

6. After conducting an exhaustive review of the facts and law during the contested case hearing, the Council concludes that the 33.55 acres the DEQ determined constitute an alluvial valley floor do not enhance or facilitate the past or present use, based on regional agricultural practices. Therefore, the 33.55 acres do not constitute an alluvial valley floor as that term is defined in the applicable statutes and regulations, and Triton should not be required to satisfy those statutory and regulatory requirements that pertain to alluvial valley floors.

ORDER

The decision of the Department of Environmental Quality designating the 33.55 acres in the Hay Creek Tract as an alluvial valley floor is overturned.

IT IS SO ORDERED THIS 11 day of February, 2002.



Robert Rawlings, Hearing Examiner
ENVIRONMENTAL QUALITY COUNCIL
Herschler Bldg., Rm. 1714
122 West 25th Street
Cheyenne, WY 82002
Tel: (307) 777-7170
Fax: (307) 777-6134

CERTIFICATE OF SERVICE

I, Terri A. Lorenzon, certify that at Cheyenne, Wyoming, on the 14th day of February 2002, I served a copy of the foregoing ORDER by depositing copies of the same in the United States mail, postage prepaid, duly enveloped and addressed .o:

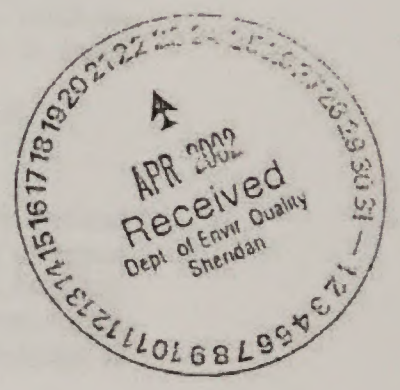
Edward W. Harris
Jerrold A. Long
HOLLAND & HART LLP
2515 Warren Avenue, Suite 450
Cheyenne, WY 82001

and also to the following persons via interoffice mail:

Dennis Hemmer, Director
Department of Environmental Quality
122 W. 25th Street, Herschler Building
Cheyenne, WY 82002

Rick Chancellor, Administrator
Land Quality Division
122 W. 25th Street, Herschler Bldg.
Cheyenne, WY 82002

John Burbridge
Senior Assistant Attorney General
Dept. of Environmental Quality-LQD
122 W. 25th Street, Herschler Bldg.
Cheyenne, WY 82002



Terri A. Lorenzon, Esq.
Director

Page 4 of 4

APPROVED JUN 13 '02

APPENDIX J

BIOLOGICAL ASSESSMENT FOR FEDERALLY LISTED SPECIES UNDER THE ENDANGERED SPECIES ACT

APPENDIX J: BIOLOGICAL ASSESSMENT FOR FEDERALLY LISTED SPECIES UNDER THE ENDANGERED SPECIES ACT

Introduction

On March 24, 2006, Kiewit Mining Properties, Inc. (Kiewit) filed an application with the Bureau of Land Management (BLM) under the 43 Code of Federal Regulations (CFR) 3425 (Leasing on Application) for federal coal reserves in the Hay Creek II lease by application (LBA) tract (Proposed Action). The Hay Creek II LBA tract is located northwest of and immediately adjacent to existing coal leases at the Buckskin Mine, in northern Campbell County, Wyoming (map J-1).

The physical areas discussed in this assessment are defined as follows:

- proposed tract—the Hay Creek II tract as applied for (Proposed Action, 419 acres);
- BLM study area—proposed tract plus lands added by the BLM under Alternative 2 for the analysis process (1,883 acres); and
- general analysis area—the maximum area of potential surface disturbance (2,847 acres) that would result from leasing the largest possible tract (i.e., the entire BLM study area and the 0.25-mile mine support area to the north and west)[1].

Map J-2 illustrates these three areas.

Under the Proposed Action, coal extraction would occur in the entire proposed tract (approximately 419 acres). Activities related to mining the proposed tract would occur within the support area, a 0.25-mile-wide area north and west of the proposed tract (approximately 241 acres); disturbance from existing mine-related activities would continue in the remainder of the overlap area[2] (approximately 474 acres).

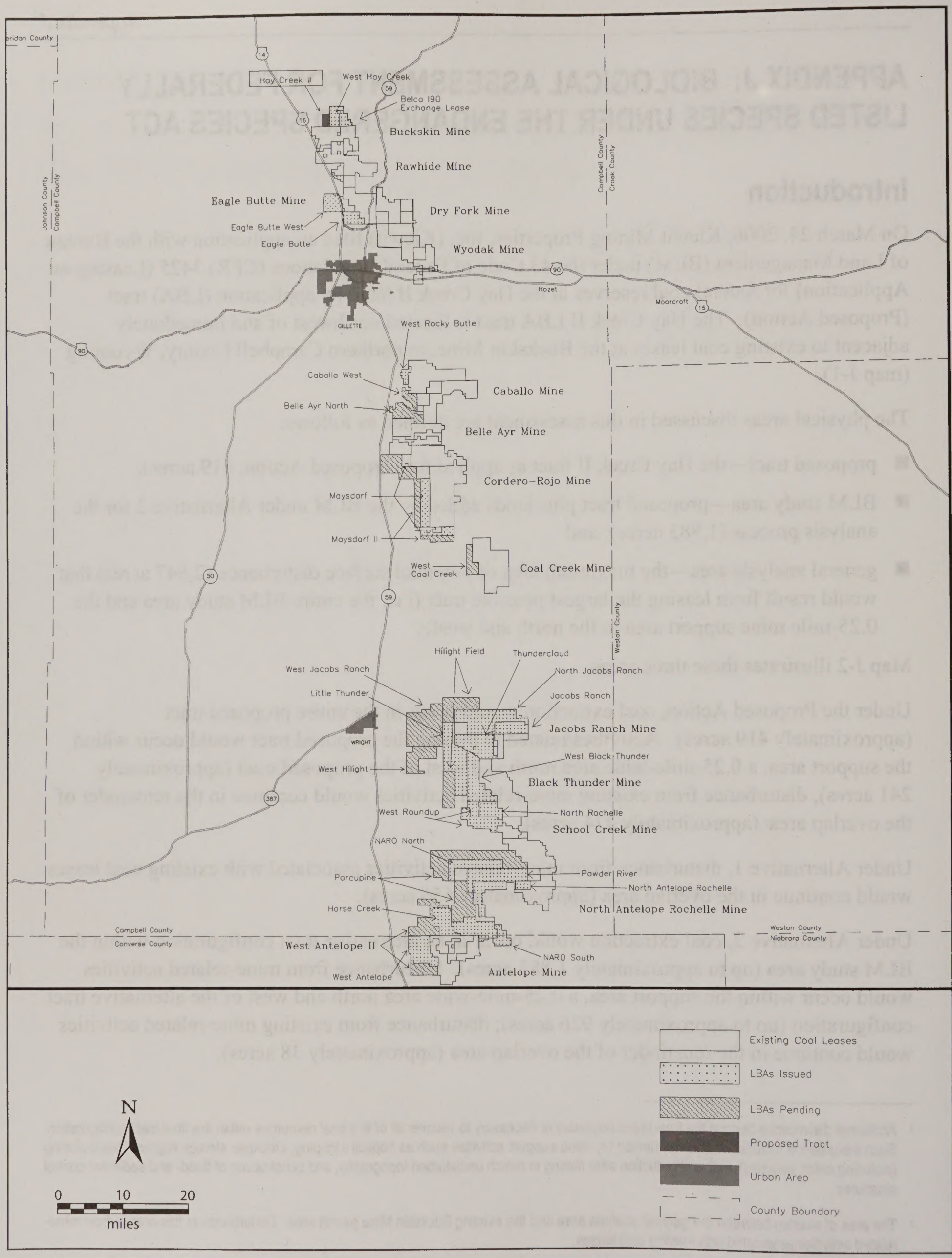
Under Alternative 1, disturbance from mine-related activities associated with existing coal leases would continue in the overlap area (approximately 656 acres).

Under Alternative 2, coal extraction would occur in an alternative tract configuration within the BLM study area (up to approximately 1,883 acres). Disturbance from mine-related activities would occur within the support area, a 0.25-mile-wide area north and west of the alternative tract configuration (up to approximately 926 acres); disturbance from existing mine-related activities would continue in the remainder of the overlap area (approximately 38 acres).

---

[1] Additional disturbance beyond the final lease boundary is necessary to recover all of the coal resources within the final tract configuration. Such disturbance includes, but is not limited to, mine support activities such as topsoil stripping, stockpile storage highwall back-sloping (including catch benches), highwall reduction after mining to match undisturbed topography, and construction of flood- and sediment-control structures.

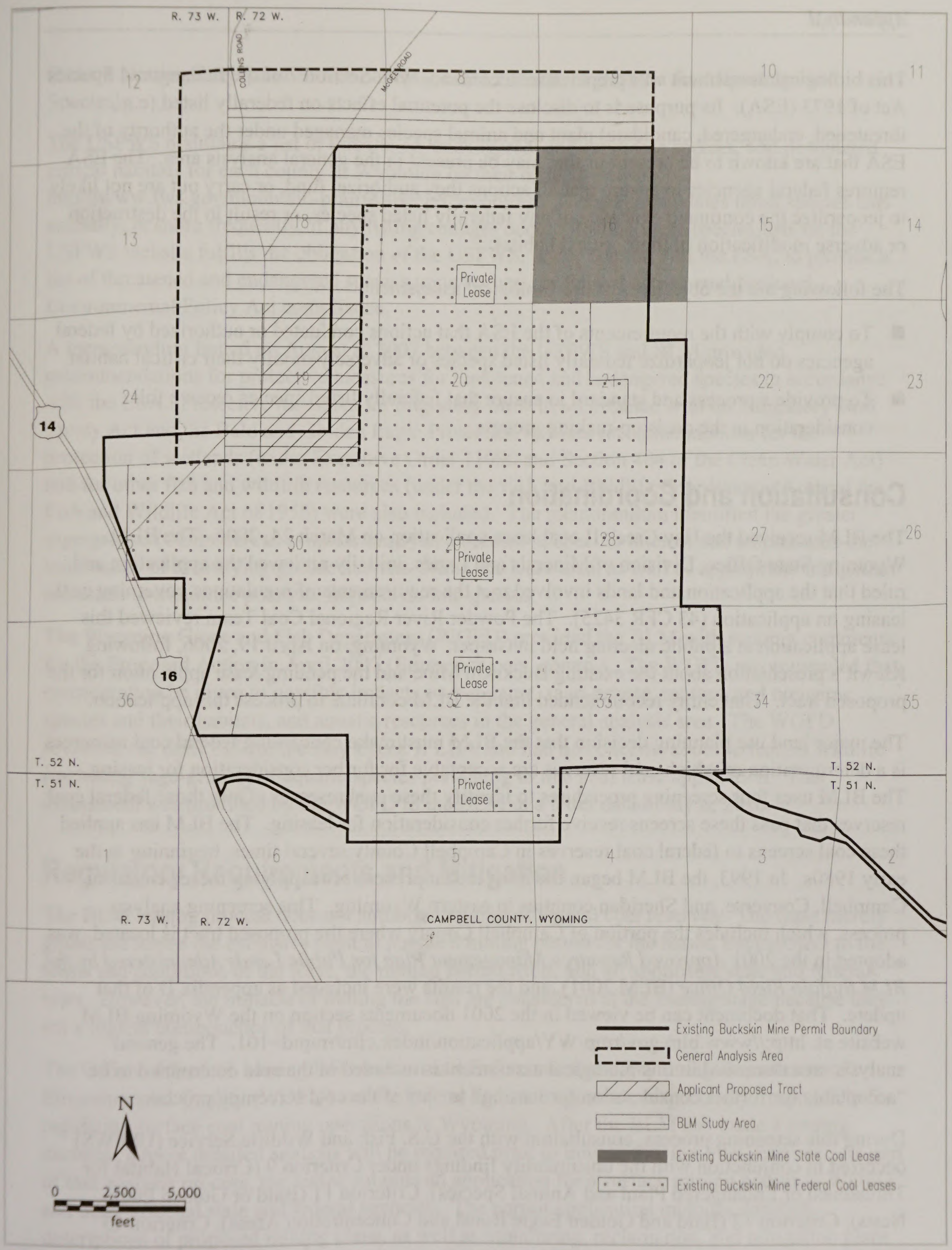
[2] The area of overlap between the general analysis area and the existing Buckskin Mine permit area. Disturbance in this area is from mine-related activities associated with existing coal leases.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map J-1

General Location Map with Federal Coal Leases and LBA Tracts



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map J-2
General Analysis Area

This biological assessment was prepared in accordance with Section 7 of the Endangered Species Act of 1973 (ESA). Its purpose is to disclose the potential effects on federally listed (e.g., threatened, endangered, candidate) plant and animal species managed under the authority of the ESA that are known to be present or that may be present in the general analysis area. The ESA requires federal agencies to ensure that all actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any federally listed species, or result in the destruction or adverse modification of their critical habitat.

The following are the objectives of this biological assessment:

- To comply with the requirements of the ESA that actions conducted or authorized by federal agencies do not jeopardize federally listed species or adversely modify their critical habitat.
- To provide a process and standard to ensure that federally listed species receive full consideration in the decision-making process.

Consultation and Coordination

The BLM received the Hay Creek II coal lease application on March 24, 2006. The BLM, Wyoming State Office, Division of Minerals and Lands, initially reviewed the application and ruled that the application and lands involved met the requirements of regulations governing coal leasing on application (43 CFR 3425). The Powder River Regional Coal Team reviewed this lease application at a public meeting held in Casper, Wyoming, on April 19, 2006, following Kiewit's presentation about the existing Buckskin Mine and the pending lease application for the proposed tract. That entity recommended that the BLM continue to process this application.

The major land use planning decision that the BLM must make concerning federal coal resources is a determination of which coal reserves are acceptable for further consideration for leasing. The BLM uses four screening procedures to identify these coal reserves. Only those federal coal reserves that pass these screens receive further consideration for leasing. The BLM has applied these coal screens to federal coal reserves in Campbell County several times, beginning in the early 1980s. In 1993, the BLM began the most recent process of reapplying these screens in Campbell, Converse, and Sheridan counties in eastern Wyoming. This screening analysis process, which includes the portion of Campbell County where the proposed tract is located, was adopted in the 2001 *Approved Resource Management Plan for Public Lands Administered by the BLM Buffalo Field Office* (BLM 2001), and the results were included as appendix D of that update. That document can be viewed in the 2001 documents section on the Wyoming BLM website at: http://www.blm.gov/rmp/WY/application/index.cfm/rmpid=101. The general analysis area discussed in this biological assessment is included in the area determined to be "acceptable for further consideration for leasing" as part of the coal screening process.

During this screening process, consultation with the U.S. Fish and Wildlife Service (USFWS) occurred in conjunction with the unsuitability findings under Criterion 9 (Critical Habitat for Threatened or Endangered Plant and Animal Species), Criterion 11 (Bald or Golden Eagle Nests), Criterion 12 (Bald and Golden Eagle Roost and Concentration Areas), Criterion 13

(Falcon Nesting Site[s] and Buffer Zone[s]), and Criterion 14 (Habitat for Migratory Bird Species).

The USFWS maintains a list of threatened, endangered, and candidate species, and designated critical habitats for each county in Wyoming on their official website: http://www.fws.gov/mountain-prairie/species/wyoming. The agency updates those species lists annually, or more frequently, if any listing changes occur. Posting these species lists on the USFWS website fulfills the obligation of the USFWS, under Section 7 of the ESA, to provide a list of threatened and endangered species upon request for federal actions and National Environmental Policy Act compliance.

A memorandum issued on August 8, 2007 between the USFWS and BLM provided recommendations for protective measures for threatened and endangered species in accordance with the ESA. Protective measures for migratory birds in accordance with the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act and recommendations for the protection of wetlands (under Executive Order 11990 and Section 404 of the Clean Water Act) and for other fish and wildlife resources (under the Fish and Wildlife Coordination Act and the Fish and Wildlife Act of 1956) were also included. The memorandum identified the greater sage-grouse (*Centrocercus urophasianus*) as a species of specific interest and emphasized the importance of identifying grouse habitats within the lease area, as well as appropriate mitigation measures to minimize potential impacts on this species.

The Wyoming Game and Fish Department (WGFD) provided the BLM with scoping comments for the Proposed Action in April 2007 (Emmerich pers. comm.). The WGFD recommended that consideration be given to possible impacts on big game, sage-grouse, raptors, and nongame species and their habitats, and aquatic resources in the general analysis area. The WGFD reviewed the draft EIS for the Hay Creek II LBA and had no concerns about terrestrial wildlife (including sage-grouse) or aquatic species pertaining to that coal lease application. That assessment was provided by the WGFD to the BLM in a letter dated May 6, 2010.

Regulatory Requirements and Mitigation

The BLM leasing process does not authorize mining of federal coal reserves. The lease merely grants the lessee the exclusive right to pursue a mining permit for the leased tract subject to the terms and conditions of the lease, the mining permit itself, and all applicable state and federal laws. However, the impacts of mining the coal are considered at the leasing stage because they are a logical consequence of that process.

The Office of Surface Mining Reclamation and Enforcement and Wyoming Department of Environmental Quality (WDEQ) are the federal and state agencies, respectively, responsible for regulating surface coal mining operations in Wyoming. After the BLM has made a leasing decision, a more detailed analysis will be required prior to mining the new coal reserves. As part of that analysis process, the lessee submits an application for a surface mining permit to WDEQ and other affected state and federal agencies. The permit application includes detailed descriptions of proposed mining plans, as well as monitoring, reclamation, and mitigation plans

designed to address known and potential impacts from mining the coal in the leased tract. Those plans are developed and implemented based on extensive baseline information collected as part of the permitting process, as required by the Surface Mining Control and Reclamation Act of 1977 (SMCRA) and Wyoming law.

If the federal coal reserves adjacent to the Buckskin Mine are leased, it would be considered a maintenance lease for the existing Buckskin Mine, which currently has both an approved Mineral Leasing Act of 1920 mining plan and approved state mining and reclamation permits. Those existing documents must be amended to include any newly leased area before it can be actively mined. To amend the existing mining plan and associated permits, Kiewit would be required to submit a detailed permit application package to WDEQ as described above. The proposed mining, monitoring, reclamation, and mitigation plans for the new lease area must be approved by multiple state and federal agencies, including the USFWS, before a permit to mine new coal reserves is issued. Those approval documents are included in the WDEQ's review process to ensure the permit application is complete and complies with all requirements, and that the coal mining operation will meet the performance standards of the approved Wyoming program. If the permit application package complies with the numerous and stringent requirements, the WDEQ would issue an amended permit to the applicant that would allow the permittee to extend coal mining operations into the newly acquired lease area.

Protection of fish, wildlife, and related environmental values is required under SMCRA regulations at 30 CFR 816.97, which state:

> No surface mining activity shall be conducted which is likely to jeopardize the continued existence of endangered or threatened species listed by the Secretary of which is likely to result in the destruction or adverse modification of designated critical habitats of such species in violation of the Endangered Species Act of 1973, as amended.

To comply with this regulation, Section 7 Consultation would be required before amendments to the existing mining and reclamation plan are approved to add the newly acquired lease area. That consultation process occurs at the permitting stage because specific details regarding the actual location of the disturbance areas in the new lease area, how and when they would be disturbed, and how they would be reclaimed are not available at the leasing stage. If the USFWS deems it appropriate, additional measures to ensure compliance with the ESA and SMCRA can be developed at that time based on potential impacts on listed species from proposed mining operations in the new lease area.

The following is a partial list of measures related to federally-protected species that are required as part of the mining and reclamation permits:

- avoiding bald eagle (*Haliaeetus leucocephalus*) disturbance per the Bald and Golden Eagle Protection Act of 1940 and the Migratory Bird Treaty Act;
- restoring bald eagle foraging areas disturbed by mining;
- using raptor safe power lines (APLIC 2006);

- surveying for Ute ladies'-tresses and other listed plant species if habitat is present; and
- implementing species-specific protective measures for listed species as the need arises.

The August 2007 memorandum between the USFWS and BLM stated that the USFWS would work with the BLM to ensure that the species-specific protective measures and programs for the conservation and recovery of listed species as required by under Section 7 of the ESA are satisfied and carried out. The current permit document for the Buckskin Mine includes a commitment to implement species-specific protective measures for federally listed species as needed. That commitment would be updated to include any newly leased or permitted lands associated with the Hay Creek II LBA prior to any new surface disturbance on those lands; updates to the protective measures themselves would also occur, as applicable.

In addition to disallowing any surface mining activity that is likely to jeopardize the continued existence of endangered or threatened species, SMCRA regulations at 30 CFR 816.97:

- require the operator to minimize disturbances and adverse impacts on fish, wildlife, and other related environmental values; and
- require that the operator use the best technology currently available to:
  - minimize electrocution hazards to raptors (APLIC 2006);
  - locate and operate haul and access roads to avoid or minimize impacts on important fish and wildlife species; and
  - design fences, conveyors, and other potential barriers to permit passage of large mammals.

Description of the Proposed Action and Alternatives

The Proposed Action

Under the Proposed Action, the BLM would hold a competitive sale and would issue a lease for the federal coal reserves included in the proposed tract. The Proposed Action assumes that Kiewit would be the successful bidder and would incorporate the proposed tract into its existing mine operations. The Proposed Action would not expand operations at the Buckskin Mine, but would maintain current levels of production for an additional period of time. The facilities and infrastructure would be the same as those currently identified in the WDEQ Mine Permit 500 Term T7, approved May 22, 2006, and the *BLM Resource Recovery and Protection Plan*, approved June 16, 2006 (BLM 2006).

The legal description of the proposed tract is provided in table J-1. The entire surface of the existing Buckskin Mine permit area and general analysis area is privately owned by individuals or companies, while most of the subsurface minerals (all of the coal and the majority of oil and gas reserves) are federally owned. All oil and gas production facilities located in the general analysis area are privately owned.

Table J-1. Legal Description of Proposed Tract

Campbell County, Wyoming, Sixth Principal Meridian Township 52 North, Range 72 West		Acres
Section 19:	Lot 5 (W ½)	20.71
	Lot 6	41.42
	Lot 7	42.45
	Lot 10	42.31
	Lot 11	41.68
	Lot 12 (W ½)	20.84
	Lot 13(W ½)	20.935
	Lot 14	41.75
	Lot 15	41.90
	Lot 18	41.97
	Lot 19	42.01
	Lot 20 (W ½)	21.065
Total Acres		**419.04**

The proposed tract includes approximately 419.04 acres. As discussed previously, it is assumed that an area larger than the proposed tract would be disturbed to allow recovery of all coal resources. Therefore, approximately 478 acres, including a mine support area north and west of the proposed tract, would be disturbed to recover the coal reserves within the proposed tract under this alternative. Surface disturbance beyond the proposed lease boundary would be due to activities such as topsoil stripping, stockpile storage, matching reclaimed topography to premining contours, constructing flood- and sediment-control structures, and numerous other similar operations.

Much of the western boundary of the proposed tract is adjacent to Campbell County Road 23 (Collins Road). In accordance with SMCRA, and as specified under unsuitability criterion 3 (43 CFR 3461), lands within 100 feet of the outside line of the right-of-way of a public road are considered unsuitable for surface coal mining. Consequently, the coal reserves underlying the Collins Road, its right-of-way, and an associated 100-foot buffer zone cannot be accessed under current conditions unless Kiewit pursues an exception to this prohibition and the Campbell County Board of Commissioners allows the public road to be relocated or closed. Neither the applicant nor the commissioners has submitted a proposal to move this road, and Kiewit does not anticipate pursuing that option.

Alternative 1 (No Action)

Under Alternative 1, the No Action Alternative, Kiewit's application to lease the coal included in the proposed tract would be rejected: federal coal reserves adjacent to the existing Buckskin

Mine would not be offered for competitive sale, and the additional coal would not be mined. However, selection of this alternative would not preclude Kiewit or another company from submitting a future lease application for these adjacent coal reserves.

Under Alternative 1, currently permitted mining activities associated with existing coal leases at the Buckskin Mine would not be affected. The facilities, infrastructure, employment levels, and reclamation efforts under this alternative would be the same as those currently identified in the WDEQ Mine Permit 500 Term T7, approved May 22, 2006, and the *BLM Resource Recovery and Protection Plan*, approved June 16, 2006 (BLM 2006). Approximately 656 acres of the general analysis area overlaps the existing permit boundary. Therefore, under the No Action Alternative, activities associated with mining existing leases would occur in this overlap area, but would be limited to topsoil stripping, stockpile storage, and other support activities related to mining existing coal leases. Average annual production would continue as described under the Proposed Action.

Alternative 2

Under Alternative 2, the BLM would hold a competitive sale and would issue a lease for the federal coal reserves included in an alternative tract configuration. The alternative tract configuration would be defined by the BLM from lands within the BLM study area (map J-2) to be technically, economically, and environmentally preferable to the proposed tract. The alternative tract configuration could be smaller than the proposed tract, or include part or all of the BLM study area. As described previously, additional disturbance would occur due to mine-related activities in the support area north and west of the final tract configuration.

As under the Proposed Action, Alternative 2 assumes that Kiewit would be the successful bidder and would incorporate the alternative tract configuration into its existing mine operations. Alternative 2 would not expand operations at the Buckskin Mine, but would maintain current levels of production for up to six more years.

Table J-2 provides the legal description of the BLM study area.

Table J-2. Legal Description of BLM Study Area

Campbell County, Wyoming, Sixth Principal Meridian Township 52 North, Range 72 West	Acres
Section 7: Lots 17 through 20	166.91
Section 8: Lots 13 through 16	162.00
Section 9: Lots 13 through 15	120.58
Section 17: Lots 1 through 4, 5 (N. ½), 6 (N. ½), 7 (N. ½), and 8 (N. ½)	247.39
Section 18: Lots 5 through 11, 12 (N. ½, SW. ¼), 13 (W. ½), 14 through19, and 20 (W. ½)	612.95
Section 19: Lots 5 (W. ½), 6 through 11, 12 (W. ½), 13 (W. ½), 14 through 19, and 20 (W. ½)	573.27
Total Acres	**1,883.10**

Not all of the coal included in the proposed tract and BLM study area is considered mineable at present. An occupied residence and a portion of the Collins and McGee roads overlie some of the coal included under Alternative 2. As discussed under the Proposed Action, SMCRA prohibits mining within 100 feet on either side of the right-of-way of any public road (43 CFR 3461); the same prohibition applies to lands within 300 feet of an occupied residence. Kiewit is not considering acquiring the surface rights to the occupied residence, and has not applied to relocate either of the county roads. Consequently, additional coal reserves between the two roads would not be disturbed if the coal under the roads was not mined. Although the federal coal underlying the county road right-of-way and associated buffer zones may not be mined, it is included in the analysis because it would allow maximum recovery of the mineable coal adjacent to, but outside of the rights-of-way and associated buffer zones.

If a decision is made to hold a competitive lease sale, and if the sale has a successful bidder, a lease would be issued for federal coal reserves within the final tract delineation, as determined by the BLM. It is assumed that the applicant would be the successful bidder at the lease sale. The final tract configuration offered for lease would be subject to standard and special lease stipulations developed for the Wyoming Powder River Basin (PRB).

One stipulation developed for the Wyoming PRB relating to threatened and endangered species is presented below:

THREATENED, ENDANGERED, CANDIDATE, or OTHER SPECIAL STATUS PLANT and ANIMAL SPECIES – The lease area may now or hereafter contain plants, animals, or their habitats determined to be threatened or endangered under the Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 et seq., or that have other special status. The Authorized Officer may recommend modifications to exploration and development proposals to further conservation and management objectives or to avoid activity that will contribute to a need to list such species or their habitat or to comply with any biological opinion issued by the Fish and Wildlife Service for the Proposed Action. The Authorized Officer will not approve any ground-disturbing activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the Endangered Species Act. The Authorized Officer may require modifications to, or disapprove a proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species, or result in the destruction or adverse modification of designated or proposed critical habitat.

The lessee shall comply with instructions from the Authorized Officer of the surface managing agency (BLM, if the surface is private) for ground disturbing activities associated with coal exploration on federal coal leases prior to approval of a mining and reclamation permit or outside an approved mining and reclamation permit area. The lessee shall comply with instructions from the Authorized Officer of the Office of Surface Mining Reclamation and Enforcement, or his designated representative, for all ground disturbing activities taking place within an approved mining and reclamation permit area or associated with such a permit.

General Setting

The terrain in the general analysis area consists primarily of gently sloping uplands and relatively level agricultural fields, with more rugged terrain in the northeastern portion of the area. Elevations in the general analysis area range from approximately 4,080 to 4,380 feet above mean sea level.

Predominant wildlife habitat types classified in the general analysis area broadly correspond with the major plant communities defined during the vegetation baseline study. The proposed tract is dominated (approximately 71%) by various upland grassland habitats. Habitats in the general analysis area are comprised primarily (71%) of upland grasslands (approximately 40%) and agricultural lands (croplands and pastures, 31%). No sand dunes or prairie dog (*Cynomys* spp.) colonies are present in the general analysis area.

No major drainages pass through the proposed tract itself, though a closed, unnamed drainage system crosses its northwestern corner. Hay Creek flows from west to east through the northern half of the general analysis area, with a considerable portion passing through the existing Buckskin Mine permit area. Several primary and secondary tributaries are also in that area. Under natural conditions, Hay Creek and all tributaries in the area are considered ephemeral (i.e., respond only to rainfall or snowmelt events). The determination of stream classification was made using the flume monitoring data collected by the Buckskin Mine and reported in the existing permit document.

The National Wetland Inventory (NWI) mapping system shows several wetlands occurring in the general analysis area (USFWS 2007). Many of these areas correspond with wetlands and other waters of the U.S. that were identified during previous wetland delineations of the Buckskin Mine; however, some of the information shown on these maps is relatively old and does not reflect current conditions. Based on the NWI maps, approximately 64.44 acres of wetlands have been identified in the general analysis area. Of these, 30.7 acres were determined to be potentially jurisdictional wetlands based on field observations; the remaining 33.74 acres were initially determined to be nonjurisdictional non-wetlands (e.g., borrow pits, old impoundments) or no longer present. The majority of the potential jurisdictional wetlands were associated with Hay Creek and other ephemeral tributaries in the general analysis area. Some wetlands previously mapped on the NWI may have been altered due to agricultural uses and permitted mine disturbance or water production related to coal bed natural gas (CBNG) production in the general analysis area.

Wetlands occur in a variety of forms in the general analysis area, with palustrine wetlands being the most common and abundant. Palustrine wetlands are defined by their close association with emergent herbaceous marshes, swales, or wet meadows and are supported by saturated soils along the banks of the drainages (Cowardin et al. 1979). Wetlands support a variety of vegetation types and occur mainly along drainages in the general analysis area. Hydrology for these areas is provided primarily by surface runoff from adjacent uplands and discharged CBNG waters.

Hay Creek, which flows primarily from the west to east, and several other tributaries that generally flow into Hay Creek, are waters of the U.S. These tributaries are primarily intermittent stream channels, open water, and other stream channels that carry water but do not meet the criteria for classification as wetlands. The Buckskin Mine's approved mining plan allows disturbance of a portion of the Hay Creek channel. Beginning in 2006, approximately 1.75 miles of the channel were diverted into the Hay Creek Diversion to facilitate mining in the northern extent of the existing Buckskin Mine permit area; the diversion runs through the overlap between the general analysis area and the existing permit area.

Soils in the general analysis area consist mainly of loams, sandy loams, and some clay loams. One hydric soil unit, Felix Clay, is located in the general analysis area (NRCS 2008), on slopes ranging from 0 to 2% and in soils that are developing in alluvium derived from sandstone and shale on gently sloping uplands.

CBNG discharge water has increased the frequency and duration of streamflow events in some portions of the general analysis area. The USFWS NWI maps (2007) show one small wetland (a 0.24-acre diked impoundment) in the extreme northwestern corner of the proposed tract; however, field observations over the years have indicated that it is wet primarily during early spring months. A second NWI inventoried wetland (0.24 acre) in the mine support area north of the proposed tract would be affected by disturbance associated with mine support activities such as topsoil stripping and stockpiling. One playa and one small instream impoundment are in the northwestern portion of the surrounding general analysis area. Those features are also seasonal, with water typically present in spring but dry by mid- to late summer. The playa is the only water body in the general analysis area that provides habitat for waterfowl, shorebirds, and other aquatic species. Due to its limited availability, it serves primarily as a staging area during spring migrations. Due to the lack of permanent water sources, the general analysis area does not support any fisheries.

A wide variety of existing mine facilities, operations, and reclamation activities are present in the overlap between the general analysis area and existing Buckskin Mine permit area, and throughout the permit area itself. Facilities present include storage silos, coal crushing and preparation plants, a railroad spur and loading facility, among others. Mining activities involve a variety of heavy equipment operations that occur 24 hours per day every day of the year; blasting occurs during daylight hours on a nearly daily basis. Reclamation efforts also involve heavy equipment. Disturbance and reclamation activities occur incrementally through the area. Because the mine operates at night, artificial lighting is present in active pit areas and on haul roads to ensure the safety of mine employees.

General Survey Requirements and History

The BLM Data Adequacy Standards for the Powder River Coal Region (BLM 1987) describe the minimum data requirements needed to make coal leasing recommendations within the PRB Coal Production Region. Because most coal mines in the PRB have collected long-term annual monitoring data for both vertebrates and plants as part of their WDEQ permit requirements, and

because most surveys include lands outside the current permit area, the BLM typically accepts that annual monitoring information as meeting the minimum requirements of these standards. The long-term (27 years) database available for vertebrate species in the Buckskin Mine permit area and surrounding lands meets those minimum requirements. Vegetation monitoring and surveys have also been conducted over multiple years, though such surveys are typically limited to the permit area or proposed expansion area and a 0.25-mile-wide support area.

Due to their proximity to the existing Buckskin Mine permit area, the entire proposed tract and the southern third (33%) of the general analysis area have been included in annual wildlife surveys for the last 27 years (1984 through 2010). Approximately 95% of the general analysis area has been surveyed annually for the last nine years (2002 through 2010) in conjunction with a previous permit amendment at the mine. The entire general analysis area and expanded adjacent lands were included in targeted baseline surveys conducted for the LBA process from late 2007 through 2010. All wildlife surveys are conducted according to the most current agency protocols; those protocols are described in detail in the Wildlife Data Report for the Hay Creek II EIS. Those reports can be viewed at the BLM Wyoming High Plains District Office in Casper, Wyoming. Additional wildlife sightings are also recorded during every site visit.

Potential habitat for the Ute ladies'-tresses (*Spiranthes diluvialis*) within the general analysis area was identified prior to field work using the U.S. Geologic Survey quadrangle map or aerial photographs. The NWI system was also consulted. Typically, individual sub-polygons were created within each polygon representing a logical sampling unit.

Habitat Management, Inc. conducted a survey for the Ute ladies'-tresses on August 28, 2008. LandTrak Resources, Inc. conducted another survey for this species on September 9, 2009, with a follow-up survey conducted on August 28, 2010. Both surveys were conducted during the official flowering period, as determined by BLM and USFWS biologists. Habitat Management, Inc. conducted similar surveys for this species in portions of the general analysis area in 2004, 2006, and 2007. During surveys, particular attention was placed on identifying areas where its preferred vegetation canopy and use conditions are met. A 100% pedestrian survey of the vegetation communities with supporting facultative wet or obligatory wetland plant species within the area was performed each year from 2008 through 2010. Because this species is commonly associated with grasses, sedges, rushes, shrubs, and riparian trees, the presence or absence of those plant species was noted. Areas that receive full sunlight or that are only partially shaded are more likely to support populations of this species than deeply shaded sites. Such sites were also noted and recorded during the field surveys. The presence or absence of potential orchid habitat types was physically confirmed through the field surveys. Wetlands in all areas including all stream channels, alluvial terraces, sub-irrigated meadows, and any other locations where the soil has the potential to be at least temporarily saturated within 18 inches of the surface for at least one week during the growing season were identified, located in the field, and plotted on the site map. Highly disturbed or modified sites, upland sites, sites entirely inundated by standing water, sites with heavy clay soils, and very saline sites were noted and excluded from vegetation in soil analysis, since they do not represent a potential Ute ladies'-tresses habitat. Sites with dense stands of reed canarygrass, greasewood, teasel, and common

reed were also excluded from further scrutiny. Areas that support facultative wet or obligatory wetland plant species were identified during the survey.

Habitat Management, Inc. conducted a survey for potential blowout penstemon (*Penstemon haydenii*) habitat in the general analysis area in 2008. LandTrak Resources, Inc. conducted three surveys for the species: June 17, 2009; July 9, 2009; and July 7, 2010. All surveys were conducted in Sandy Prairie vegetation communities in section 18 and section 19, T52N R72W. Potential habitat for this species was identified and divided into logical polygons or sites. Each of these polygons was surveyed for the attributes listed in the USFWS *Penstemon haydenii* memorandum. These attributes include:

- sand dune or blowout features and
- disturbed areas of significantly low ground with sand, sandy loam, or loamy sand soils

Grazed and weedy areas meeting any of the potential habitat conditions for this species noted above were surveyed regardless of grazing use levels or severity of weed infestation.

Threatened and Endangered Species

According to USFWS information (2010) available when this document was initially prepared, four species currently listed or proposed for listing under the ESA could occur in the general analysis area: blowout penstemon (endangered), Ute ladies'-tresses (threatened), greater sage-grouse (candidate), and mountain plover (*Charadrius montanus*) (proposed for listing as threatened). No current threatened or endangered vertebrate species have been observed in or within 1 mile of the general analysis area. No critical habitats for federally listed species, or core or connectivity areas for sage-grouse, have been designated by the USFWS (2010) or the State of Wyoming (2010), respectively, in the general analysis area or surrounding lands.

The black-footed ferret (*Mustela nigripes*) is no longer included as a federally listed species for Campbell County, Wyoming, which includes the general analysis area (USFWS 2010). Additionally, the USFWS issued a block clearance for this species in all black-tailed prairie dog (*Cynomys ludovicianus*) colonies throughout Wyoming in early 2004 (USFWS 2004). Consequently, surveys are no longer recommended for black-footed ferrets in those colonies statewide. Furthermore, the general analysis area is not within the region currently identified for black-footed ferret reintroductions (U.S. Forest Service 2002, Grenier 2003). Although this is not a federally listed species for the general analysis area, it remains on the national list of endangered animals. As a result, the USFWS encourages project proponents to protect all prairie dog colonies or complexes for their value to the prairie ecosystem and the many species that rely on them. The agency further encourages project applicants to analyze potentially disturbed prairie dog colonies for their value to future black-footed ferret reintroductions. No prairie dog colonies will be disturbed under any alternative considered in the analysis for the Hay Creek II EIS.

The following discussion describes species' habitat requirements and their occurrence in the general analysis area, and evaluates the potential environmental effects of the action alternatives on the current federally listed (threatened, endangered, candidate, and proposed) species in the project area.

Additional detailed information on the affected environment in the general analysis area as well as long-term results from annual monitoring in the vicinity are provided in the Vegetation Data Report and Wildlife Data Report, which can be viewed at the BLM Wyoming High Plains District Office in Casper, Wyoming.

Endangered Species

Blowout Penstemon (Penstemon haydenii)

The blowout penstemon, a member of the figwort family, was listed as endangered on October 1, 1987. It was added to the list of threatened and endangered species for Campbell County in 2008. This species is narrowly endemic to blowouts in sparsely vegetated, shifting sand dunes. The removal of fire, leveling of dunes, reduction of grazing, and cultivation of stabilizing cover crops drastically reduced the amount of habitat available for this species. Loss of habitat, coupled with impacts from insect outbreaks, drought, inbreeding, and potential over collection, has caused problems for the plant (University of Wyoming 2009). Additional threats to the plant may occur when sand dunes are removed or overly disturbed by vehicular traffic (USFWS 2008).

The current stronghold for this species is in western Nebraska. Approximately 3,500-5,000 plants are currently found in multiple locations in that region. The plant was first discovered in Wyoming in 1877 and then rediscovered in 1996 (BLM 2008). The Wyoming population is limited to three sites in the Ferris dunes in northern Carbon County that contain several thousand plants (BLM 2008); those dunes are more than 225 miles southwest of the general analysis area.

Biology and Habitat Requirements

The blowout penstemon is a perennial forb with stems less than 12 inches tall. The inflorescence is 2 to 6 inches long and has 6 to 10 compact whorls of milky-blue to pale lavender flowers. Flowers typically bloom from mid-June to early-July.

This species requires an early succession habitat in sand blowouts. The plant's current know range in Wyoming is restricted to two habitat types: steep, northwest-facing slopes of active sand dunes with less than 5% vegetative cover; and on north-facing sandy slopes, on the lee side of active blowouts with 25% to 40% vegetative cover (USFWS 2008).

Affected Environment

The general analysis area is not within the documented historical range of the blowout penstemon in Wyoming. That area is located approximately 170 miles northwest of the known Nebraska sites and approximately 225 miles northeast of the Wyoming occurrences.

Approximately 16% (455 acres) of the general analysis area is identified as Sandy Prairie Grassland and potentially would contain sand dune and blowout features. Portions of the general analysis area are moderately grazed by livestock and some areas have infestations of weedy species such as Canada thistle.

Results of targeted surveys determined that no suitable blowout penstemon habitat is present in the general analysis area; no sand dunes (whether stable or blown out) are currently present in that area. Likewise, no blowout penstemon specimens were found in any of the seven potential sites surveyed in 2009 or 2010. The general analysis area is dominated (71%) by upland grasslands and agricultural lands. The graminoid-dominated Sandy Prairie uplands provide significant ground cover that precludes the development of shifting dune features. The soils in the surveyed sites are stable and no blowout features are present. Blowout penstemon remained undetected in southwest Wyoming for many years. This species can potentially remain dormant below ground for several years and thus be undetectable during surveys. However, given the results from multiple survey years and the existing habitat conditions, the probability appears extremely low that this species is present within the general analysis area.

Environmental Consequences

Mining the federal coal reserves under the Proposed Action or Alternative 2 would have no effect on the blowout penstemon.

No specimens of blowout penstemon were found during surveys conducted in the study area from 2008 through 2010. Typical suitable habitat for this species is non-existent in the general analysis area, which makes it highly unlikely that populations have gone undetected. However, should such populations be present, they could be lost to surface disturbing activities if appropriate habitat were disturbed. Any potential habitat that has not already been surveyed for blowout penstemon within the project area should be identified and surveyed prior to surface mining activities.

The potential habitat where blowout penstemon could occur within the general analysis area is extremely limited and typically not suitable for the key reasons listed below.

- The sites present with either dune-like or blowout features within the general analysis area are extremely limited in size, typically less than 0.1 acre.
- The Sandy Prairie Grassland is dominated by graminoid species which provide substantial ground cover and soil stability.
- Graminoid species typically occur in a more advanced successional and site transitional state than blowout penstemon, which is a pioneering species.

Based on the existing characteristics of the general analysis area, further evaluation of the area for this species is likely unwarranted.

Cumulative Effects

This species is potentially vulnerable to habitat loss and degradation resulting from sand mining, water development, energy development, residential development, ORV use, and associated destabilization of its sand dune habitat. It also could be vulnerable to negative effects related to the spread of non-native species within its range. As no potential habitat for this species is present within the general analysis area, leasing the federal coal reserves would not contribute to cumulative adverse effects for the blowout penstemon.

Threatened Species

Ute Ladies'-Tresses (Spiranthes diluvialis)

The Ute ladies'-tresses, a member of the orchid family, was listed as threatened on January 17, 1992, due to a variety of factors, including habitat loss and modification, hydrological modifications of existing and potential habitat areas, and invasion of exotic plant species. At the time of listing, this species was only known from Colorado, Utah, and extreme eastern Nevada. Ute ladies'-tresses were discovered in Wyoming in 1993. It is currently known from western Nebraska, eastern Wyoming, north-central Colorado, northeastern and southern Utah, east-central and southeastern Idaho, southwestern Montana, and central Washington.

Biology and Habitat Requirements

The Ute ladies'-tresses is a perennial, terrestrial orchid with erect, glandular-pubescent stems 8 to 20 inches tall arising from tuberous-thickened roots. In Wyoming, this species typically blooms from late July or early August to early September, with fruits produced from mid-August to September (Fertig 2000). Ute ladies'-tresses can only be reliably located and positively identified when they are flowering (Heidel 2001). The flowers are white or ivory and clustered into a spike at the top of the stem; however, depending on location and climatic conditions, it may bloom in early July or still be in flower as late as early October (Heidel 2007). Plants probably do not flower every year and may remain dormant below ground during drought years. In general, the species' best flowering years seem to correspond with extreme heat during flowering. Preliminary review of climate data also indicates that growing seasons that start out as relatively cold and wet correspond with low flowering levels (Heidel 2001).

The Ute ladies'-tresses occurs primarily in areas where vegetation is relatively open and not overly dense, overgrown, or heavily over-grazed. It is commonly associated with horsetail, milkweed, verbena, blue-eyed grass, reedgrass, goldenrod, bentgrass and arrowgrass. Wyoming populations often occur in moist meadow communities dominated by redtop, common quackgrass, Baltic rush, foxtail barley, or switchgrass within a narrow vegetative band between emergent aquatic vegetation and dry upland prairie (Fertig 2000). Vegetative cover tends to range from 75% to 90% and is usually less than 45 centimeters tall (Fertig 2000). However, the orchid seems intolerant of shade and is usually found as small scattered groups that occupy relatively small areas of open vegetation within the riparian system.

The total known number of individuals of this species is currently estimated to be 83,000 individuals (Fertig et al. 2005). Occurrences range in size from one plant to a few hundred individuals. Prior to 2005, four orchid populations had been documented within Wyoming, all discovered between 1993 and 1997 (Fertig and Beauvais 1999). Four additional sites were located in 2005 and one additional site was found in 2006 (Heidel 2007). The new locations were in the same drainages or tributaries as the original four populations. Drainages with documented orchid populations include Antelope Creek and tributaries in northern Converse County, Bear Creek in northern Laramie and southern Goshen Counties, Horse Creek in Laramie County, and Niobrara River in Niobrara County.

Populations are often dynamic and "move" within a watershed as disturbances create new habitat or succession eliminates old habitat (Fertig and Beauvais 1999). The orchid is well adapted to disturbances from stream movement and is tolerant of other disturbances, such as grazing, that are common to grassland riparian habitats (USFWS 1995). Ute ladies'-tresses colonize early successional riparian habitats such as point bars, sand bars, and low-lying gravelly, sandy, or cobbley edges, persisting in those areas where the hydrology provides continual dampness in the root zone through the growing season. Soils where the orchid has been found typically range from fine alluvial silt/sand to gravels and cobbles, as well as in highly organic and peaty soil types, or whitish loamy clay with a slightly basic pH. The orchid can also become established in heavily disturbed sites, such as revegetated gravel pits, heavily grazed riparian edges, and along well-traveled foot trails on old berms (USFWS 1995). This species is not found in heavy or tight clay soils or in extremely saline or alkaline soils.

Affected Environment

The general analysis area is not within the documented range of the Ute ladies'-tresses in Wyoming; no occurrences have been recorded in Campbell County. The nearest documented record of Ute ladies'-tresses is the Antelope Creek population, approximately 70 miles southwest of the general analysis area. Most of the potentially suitable habitat in the general analysis area is found along Hay Creek. This primary drainage, which flows generally from west to east through the northern portion of the general analysis area, is classified as an ephemeral stream in this area. Limited portions of Hay Creek and its tributary drainages may receive recharge from bank storage making them locally intermittent. In response to recent surface discharge of groundwater associated with CBNG development on or upstream of the general analysis area, streamflow occurrence is now more persistent and some drainage channels are seldom completely dry.

Several unnamed and named ephemeral tributaries drain portions of the general analysis area though, as described above. Only one drainage intersects the proposed tract itself; that drainage does not connect with Hay Creek. One small (0.24 acre) impoundment is present in the northwestern corner of the proposed tract, with additional stock reservoirs present elsewhere in the general analysis area. The stock reservoirs are constructed as earthen berms or dams located on these ephemeral drainages. These ponds generally contain water only in early spring, then dry up in summer.

Environmental Consequences

Mining the federal coal under the Proposed Action or Alternative 2 will have no effect on Ute ladies'-tresses.

No Ute ladies'-tresses were located during surveys conducted in appropriate habitats within the general analysis area in 2004 or annually from 2006 through 2010 (LandTrak Resources 2009, 2011). No potential habitat for this species is present within the proposed tract. Previous wetland inventories identified a total of 6.71 acres of nonjurisdictional wetlands and 1.33 acres of other waters of the U.S. within or directly adjacent to Hay Creek as it flows through the overlap between the existing Buckskin Mine permit area and the general analysis area. However, most of these features have already been excavated for the extraction of coal reserves as part of the current Buckskin Mine permit, or are already permitted for disturbance due to their location within the existing permit area. Additionally, coal reserves under and within 100 feet of the Collins and McGee roads, and within 300 feet of an occupied residence, are considered "unsuitable for mining" under BLM coal unsuitability criterion 3. Because Kiewit has not applied to relocate either road and does not intend to obtain surface rights for the occupied residence, the lands between the two roads and west of the Collins Road are operationally blocked from mining. Consequently, no new potential Ute ladies'-tresses habitat has been added by the Proposed Action or Alternative 2 that is not already approved for disturbance.

Because this species can persist below or above ground without flowering, single season surveys that meet the current USFWS survey guidelines may not detect populations; surveys in the general analysis area have been conducted during the last five consecutive flowering seasons (2006 through 2010).

Potential habitat for Ute ladies'-tresses is extremely limited within the general analysis area and typically is not suitable for this species for a number of key reasons:

- Wet meadow habitat types typically support aggressive rhizomatous graminoid plant species. These potential habitat sites are well-established plant communities that typically have dense under-story cover. This orchid normally does not grow in such conditions.
- Soils trend from moderately to very saline/sodic. A number of the potential habitat sites have visible saline/sodic crusts. Inland saltgrass and foxtail barley are often the only species growing in these areas.
- CBNG dewatering and treatment activities have caused major impacts to all of the watersheds within the proposed amendment area. Areas that have been historically wet are now dry, and new areas are now wet where CBNG waters are discharged/treated. The historic groundwater and soil moisture conditions have been altered or disrupted and major shifts in plant community distribution have occurred or are occurring.
- Livestock grazing has impacted the quality of riparian areas. Livestock use during the wetter times of the year adversely impacts potential Ute ladies'-tresses habitat.

Stormwater runoff varies considerably from year to year. A reliable supply of surface water is not always available during the middle and late summer to support late growth plant species. This serves to further limit the presence of potential Ute ladies'-tresses habitat within the general analysis area; the quality of potential habitats is extremely poor.

Any jurisdictional wetlands that are destroyed by mining operations would be replaced in accordance with the requirements of Section 404 of the Clean Water Act, as determined by the Corps. The replaced wetlands may not duplicate the exact function and landscape features of the premine wetlands. The Corps considers the type and function of each jurisdictional wetland that will be impacted and may require restoration of additional acres if the type and function of the restored wetlands will not completely replace those of the original wetlands. Replacement of nonjurisdictional and functional wetlands may be required by the surface land owner and/or WDEQ. That agency allows and sometimes requires mitigation of nonjurisdictional wetlands affected by mining, depending on the values associated with the wetland features. The WDEQ also requires replacement of playas with hydrologic significance.

Cumulative Effects

Alterations of stream morphology and hydrology are believed to have extirpated Ute ladies'-tresses from most of its historical range (USFWS 1995). Disturbance and reclamation of streams by surface coal mining may alter stream morphology and hydrology. The large quantities of water produced with CBNG development and discharged on the surface may also alter stream morphology and hydrology. However, no typical suitable habitat for Ute ladies'-tresses is present within the proposed tract. Additionally, no orchids have been documented during repeated surveys of typical suitable habitat in the portion of the Hay Creek drainage included in the BLM study area. Furthermore, nearly the entire Hay Creek drainage under that alternative has already been approved for disturbance, and most of that disturbance has already occurred. The remaining drainage reach that may provide typical suitable habitat for this species is within one or more areas designated as unsuitable for mining. Therefore, leasing the federal coal reserves is not likely to contribute to cumulative adverse effects for the Ute ladies'-tresses.

Candidate Species

Greater Sage-grouse (Centrocercus urophasianus)

The sage-grouse was determined to be warranted for listing under the ESA in March 2010, but that listing was precluded by higher priority species. Although the sharp-tailed grouse does not have the same status as sage-grouse, it has been documented at the Buckskin Mine over the years. Surveys for both species are conducted using current agency protocols. Consequently, portions of the following discussion apply to both species. However, because sharp-tailed grouse are not involved in the listing process, no information specific to that species is provided in this appendix.

Sage-Grouse Life History

The sage-grouse is considered a "landscape species," which means that large expanses of unfragmented land are required to provide all the habitat components necessary for their annual life cycle. This species is a sagebrush-obligate, and requires sagebrush habitat year-round for food, cover, and shelter, and for every phase of its life cycle. Sage-grouse often exhibit seasonal movements to use discrete sagebrush habitats, though the distance traveled varies widely among populations. These movements are often in response to devotion to seasonal-use areas (i.e., breeding, nesting/brood rearing, summering, and wintering), with adjustments related to severity of winter weather, topography, and vegetative cover.

Sage-grouse breeding occurs on leks during late March and April. Leks are generally established in open areas surrounded by Wyoming big sagebrush (*Artemisia tridentata wyomingensis*), which is used for escape cover and protection from predators. Generally, lek sites are used year after year and are considered the center of year-round activity for resident sage-grouse populations. On average, approximately two-thirds of sage-grouse hens nest within 3 miles of the lek where they were bred. New spring plant growth, residual cover, and understory are important habitat components for nesting sage-grouse hens.

Areas near nests are used for several weeks by hens for brood rearing. The habitats used during the first few weeks after hatching must provide both good cover to conceal the chicks and essential nutritional requirements during this period of rapid development. Brood-rearing habitats that have a healthy and wide diversity of plant species, particularly grasses and forbs, tend to provide the variety and abundance of insects that are an essential protein supply for the young birds.

Summer habitat consists of sagebrush mixed with areas of wet meadows, riparian, or irrigated agricultural fields. As summer progresses and forbs mature and dry up, sage-grouse broods must move to more mesic or wet meadow-type habitats where succulent plants and insects are still available. This can be especially important in drier years and during extended periods of drought. As the fall season nears, sage-grouse form flocks as brood groups come together. As fall progresses, sage-grouse move toward their winter ranges.

During winter, sage-grouse feed almost exclusively on sagebrush leaves and buds. Suitable winter habitat requires sagebrush to be accessible, especially in areas where snowfall is common. It is crucial that sagebrush be exposed at least 10 to 12 inches above snow level, as this provides food and cover for wintering sage-grouse. Population and habitat analyses suggest that wintering habitat can be as limiting as breeding habitats.

Regional and Statewide Sage-Grouse Population Trends

Overall, the sage-grouse population has been steadily declining in Wyoming and across the rest of the West. A study prepared by the Western Association of Fish and Wildlife Agencies estimated that sage-grouse populations in western North America declined at an overall rate of 2% per year from 1965 to 2003 (Connelly et al. 2004). The decline rate was greater from 1965 to 1985, with populations stabilizing and some increasing from 1986 to 2003. For Wyoming,

this study estimated that sage-grouse populations declined at an average rate of 0.51% per year from 1968 to 1986 (9.66% decline overall), and at an average rate of 0.33% per year from 1987 to 2003. Populations were lowest in the mid-1990s, with a gradual increase in numbers in some regions since that time (Connelly et al. 2004).

The general analysis area is within the Northeast Wyoming Local Sage-Grouse Working Group (NWLSWG) area, which includes portions of the WGFD Sheridan and Casper biological regions. Because the nearest USDA Forest Service lands are approximately 50 miles north and south of the general analysis area, this EIS does not include lek trends from the Thunder Basin National Grasslands. Results from that area are discussed in both the *South Gillette Coal Lease Application Final EIS* and the *Wright Area Coal Lease Application Draft EIS*, available on the Wyoming BLM website.

Sage-grouse monitoring has occurred in the NWLSWG area since 1967. Assuming the number of males per active lek accurately reflects sage-grouse populations, population trends have exhibited a cyclical pattern within this area. Periodic highs and lows in grouse numbers have occurred at approximately 10-year intervals (figure J-1). With the exception of the most recent cycle, each successive peak was lower than the preceding peak; the same was true for successive low counts. This long-term trend suggests a steadily declining sage-grouse population (WGFD 2008a).

Comparisons between sage-grouse population trends in the NWLSWG area and statewide (figure J-2) show strong similarities, though the average number of males per lek in the regional area has been lower than that observed statewide in most years. As in the NWLSWG area, the statewide sage-grouse population trend has exhibited a long-term (1960–2008) decline, a mid-term (1999–2008) increase, and a recent short-term (2006–2008) decline (WGFD 2008b). The mid- and short-term trends in statewide populations are believed to be largely weather related. Timely precipitation in some years resulted in improved habitat conditions, allowing greater numbers of sage-grouse to hatch and survive. Conversely, multi-year drought conditions are believed to have caused lower grouse survival in the early 2000s, leading to population declines.

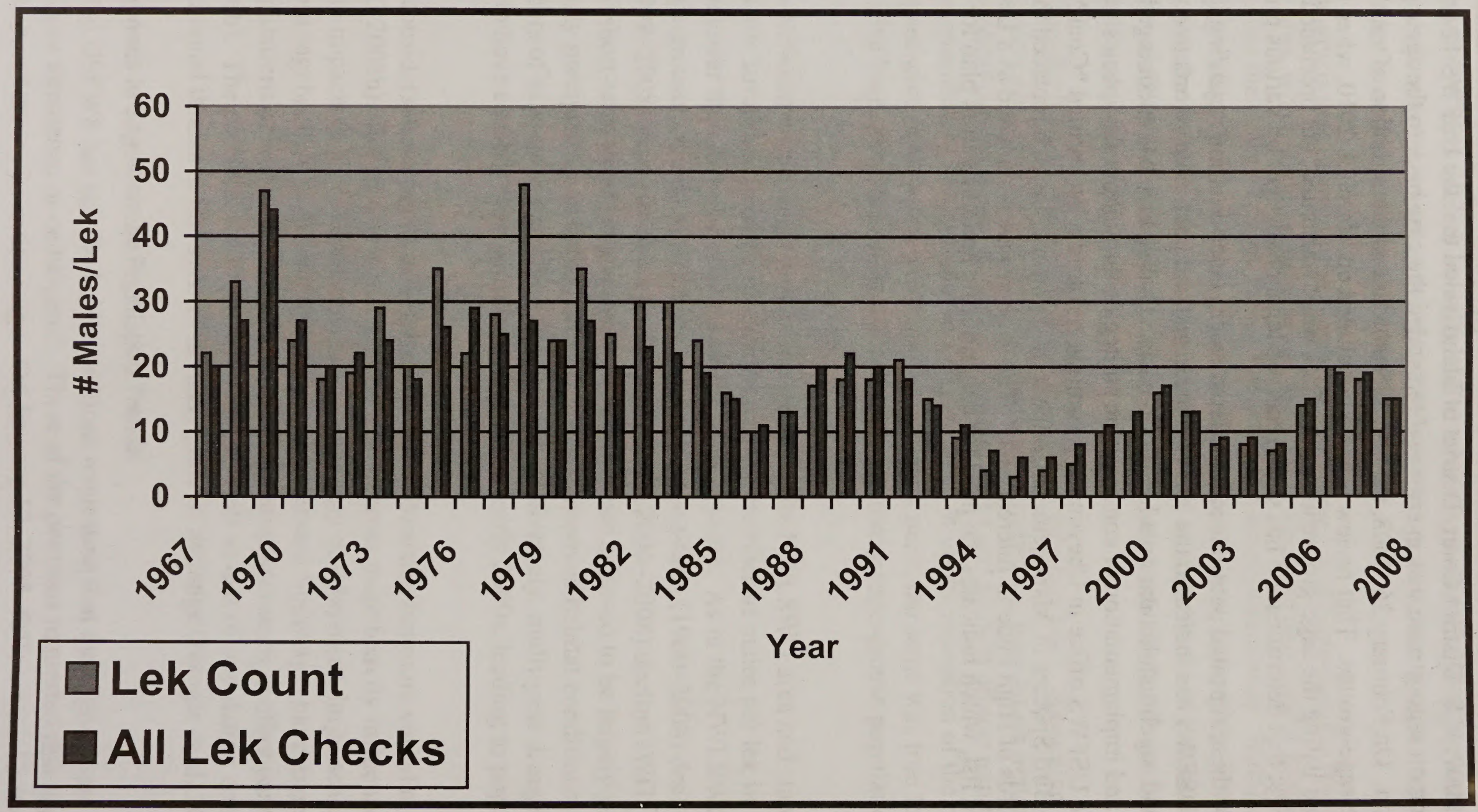
The WGFD considers these trends as valid at the statewide scale, but more varied at the local scale (WGFD 2008b). For example, sub-populations in areas more heavily influenced by anthropogenic impacts (e.g., subdivisions, intensive energy development, large-scale conversion of habitat from sagebrush to grassland or agriculture, interstate highways) have experienced declining populations or extirpation despite recent population increases in other parts of the state (WGFD 2008b). The potential for West Nile virus, as well as loss of population connectivity, represent additional threats to this species in many parts of its range (Naugle et al. 2004).

Agency Responses to Sage-Grouse Population Trends

Since 1999, the USFWS has received eight petitions requesting that the sage-grouse be listed under the ESA as threatened or endangered. Three of the petitions requested that sage-grouse be listed as endangered across its entire range. On January 12, 2005, following a 12-month status

review on the species, the USFWS concluded that listing was not warranted at that time. On December 4, 2007, U.S. District Court, District of Idaho, ruled that the USFWS 12-month petition finding on sage-grouse was in error and remanded the case back to the agency for further reconsideration. On February 26, 2008, the USFWS announced the initiation of another status review for the sage-grouse. That review process concluded on March 5, 2010, when the agency determined that listing the sage-grouse under the ESA was "warranted, but precluded" by other higher priorities; that determination has since received legal challenges by various groups.

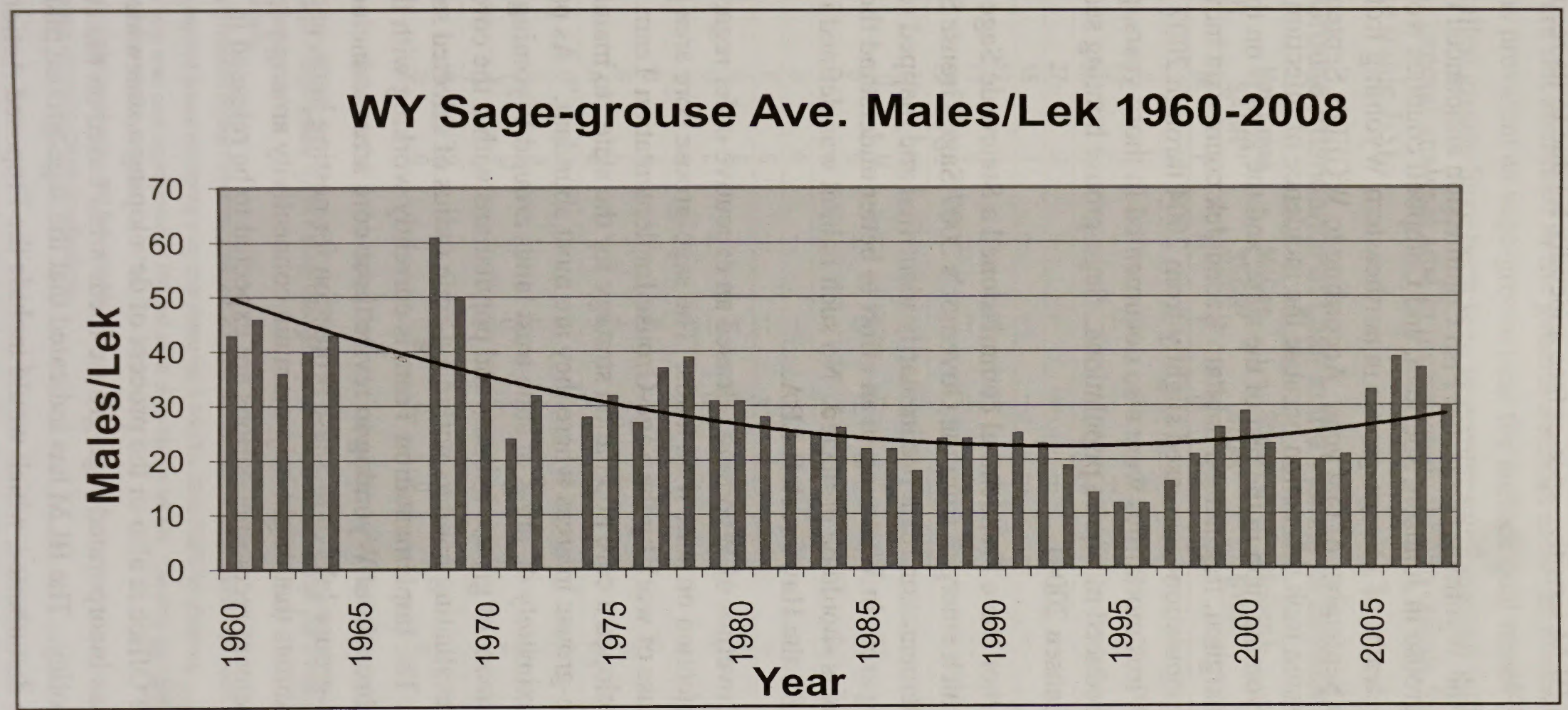
In response to these repeated petitions and the most recent determination regarding listing under the ESA, the USFWS has indicated the need for increased and continued efforts to conserve sage-grouse and sagebrush habitat on a long-term basis. That agency has encouraged continued development and implementation of conservation strategies throughout the species' range. In May 2002, the USFWS office in Cheyenne, Wyoming, released a list entitled "Coal Mine List of 40 Migratory Bird Species of Management Concern in Wyoming," which replaced the previous "Migratory Birds of High Federal Interest List." The sage-grouse is included as a Level I species on the updated list, which indicates the need for a monitoring and mitigation plan for this



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Figure J-1

Average Male Sage-grouse Lek Attendance within the Northeast Wyoming Local Working Group Area (1967–2008)



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Figure J-2

Average Number of Males per Lek Counted in Wyoming (1960–2008) with a Minimum of 100 Leks Checked Each Year

species. Although the sage-grouse continues to be managed by the WGFD, its current status as a candidate species under the ESA gives further impetus to ongoing annual monitoring efforts. The sage-grouse is also a BLM sensitive species (see appendix K) due to its recurring presence in the federal listing process.

On September 11, 2003, the Wyoming Game and Fish Commission announced that the 2003 hunting season for sage-grouse in Johnson, Sheridan, and Campbell counties would be closed. The closure followed the deaths of 11 sage-grouse in northeastern Wyoming from West Nile virus in August and early September of that year. According to WGFD's September 11, 2003, press release, the commission took this action because the incidence of infection was much higher in northeastern Wyoming than in the rest of the state, and the area is on the fringe of sage-grouse range with marginal, fragmented habitat. Recent lek count data indicate that Wyoming's sage-grouse populations increased slightly from 2004 through 2007. Lower incidences of West Nile Virus mortalities were also documented in those years, primarily due to cooler temperatures that reduced mosquito populations. Sage-grouse hunting seasons were reopened in 2004 (Christiansen 2004).

In 2007, Wyoming Governor Dave Freudenthal commissioned a Statewide Sage-grouse Implementation Team, which emerged from the Governor's 2007 Sage-Grouse Summit. On March 17, 2008, the implementation team preliminarily identified and mapped recommended sage-grouse core breeding areas in Wyoming in an effort to better understand the types of habitat grouse prefer and what areas should be protected. No such habitat was defined in the vicinity of the general analysis area for the Hay Creek II LBA.

On August 1, 2008, the Governor of Wyoming released an executive order regarding sage-grouse core area protection on state trust lands. The sage-grouse core area protection concept came about because of work by the Sage-Grouse Implementation Team. The implementation team developed a core population strategy for the state "to maintain habitats and viable populations of sage-grouse in areas where they are most abundant." As part of that effort, the team delineated approximately 40 areas of state trust lands around Wyoming with a goal of maintenance and enhancement of grouse habitats and populations within the core areas. The areas were delineated by evaluating habitats within a 4-mile radius of selected sage-grouse leks in high lek-density areas. The Implementation Team is currently working with the Local Sage-grouse Working Groups throughout Wyoming to revise those core areas to include lands within 5.3 miles of selected sage-grouse leks to increase protection for nesting hens, and to identify and protect other important habitats that might help maintain connectivity among populations. Revised maps and management recommendations are expected to be released in the latter half of 2010.

The BLM Wyoming State Office is also in the process of developing a statewide sage-grouse management policy and has incorporated sage-grouse focus areas based on the core area concept in its draft management policy. The BLM has indicated that the sage-grouse management strategy for future surface disturbance, which would include the Proposed Action and alternatives, will likely be based on its sage-grouse focus areas.

Affected Environment

Based on results from annual counts and lek searches conducted for the Buckskin Mine, sage-grouse occur but are not abundant in the general analysis area. In general, sharp-tailed grouse do not appear to be as prevalent as sage-grouse near the surface coal mines in northeast Wyoming. However, sharp-tailed grouse have been seen in greater numbers and with more frequency than sage-grouse in the general analysis area in recent years, though counts for both species have declined over time (table J-3).

Table J-3. Peak Grouse Attendance at Leks in the Vicinity of Buckskin Mine (1984–2010)

	Daly SAGR		Hay Creek SAGR*[1]		McGee SAGR[2]		Stickel STGR*		McGee I STGR		McGee II STGR*		McGee III STGR**	
Year	M	F	M	F	M	F	M	F	M	F	M	F	M	F
1984	20	1	2	U	—	—	—	—	—	—	—	—	—	—
1985	20	4	8	U	—	—	—	—	—	—	—	—	—	—
1986	12	0	12	U	—	—	—	—	—	—	—	—	—	—
1987	10	0	23	U	—	—	—	—	—	—	—	—	—	—
1988	17	0	27	U	—	—	—	—	—	—	—	—	—	—
1989	16	5	15	1	—	—	—	—	—	—	—	—	—	—
1990	9	1	12	1	—	—	—	—	—	—	—	—	—	—
1991	10	1	17	0	—	—	—	—	—	—	—	—	—	—
1992	7	1	20	5	—	—	—	—	—	—	—	—	—	—
1993	0	0	U	U	—	—	—	—	—	—	—	—	—	—
1994	0	0	U	U	—	—	—	—	—	—	—	—	—	—
1995	0	0	0	0	—	—	—	—	—	—	—	—	—	—
1996	0	0	0	0	—	—	—	—	—	—	—	—	—	—
1997	0	0	0	0	—	—	—	—	—	—	—	—	—	—
1998	0	0	0	0	—	—	—	—	—	—	—	—	—	—
1999	0	0	0	0	—	—	—	—	5	0	—	—	—	—
2000	0	0	0	0	—	—	13	1	8	0	—	—	—	—
2001	0	0	2	3	6	2	9	3	4	0	—	—	—	—
2002	0[3]		0	0	0	0	3	0	0	0	13	5	—	—
2003	0	0	0	0	1	3	0	0	0	0	8	1	—	—
2004	0	0	0	0	3	0	0	0	0	0	2	0	—	—
2005	0	0	0	0	0	0	0	0	0	0	0	0	4[4]	0
2006	0	0	0	0	U	U	0	0	0	0	0	0 0		
2007	0	0	U	U	U	U	U	U	0	0	0	0 0		
2008	0	0	0	0	0	0	U	U	0	0	0	0 0		
2009	0	0	0	0	0	0	0	0	0	0	0	0 0		
2010	0	0	0	0	0	0	0	0	0	0	0	0 0		
Mgt. Status[5]	Abandoned		Occupied	Oc	cupied	Oc	cupied		Oc cupied		Oc cupied		Oc cupied	

M= Male; F = Female; SAGR = sage-grouse; STGR = sharp-tailed grouse; U = Unknown, inaccessible due to mining; --- = lek undiscovered

* In the Buckskin Mine permit area.

** In the general analysis area.

[1] The lek was beyond the required annual monitoring area until 2002 but was checked at least once in most years.

[2] The lek is beyond the required annual monitoring area; data presented is from the 2009 WGFD lek database.

[3] Two displaying males were seen once approximately 1,000 feet south of the historic lek site. The birds were presumed to have flown in from another lek located 2.0 miles south of the Daly lek site.

[4] Birds were not displaying; number of males and females unknown.

[5] Management status based on WGFD (2010) classifications.

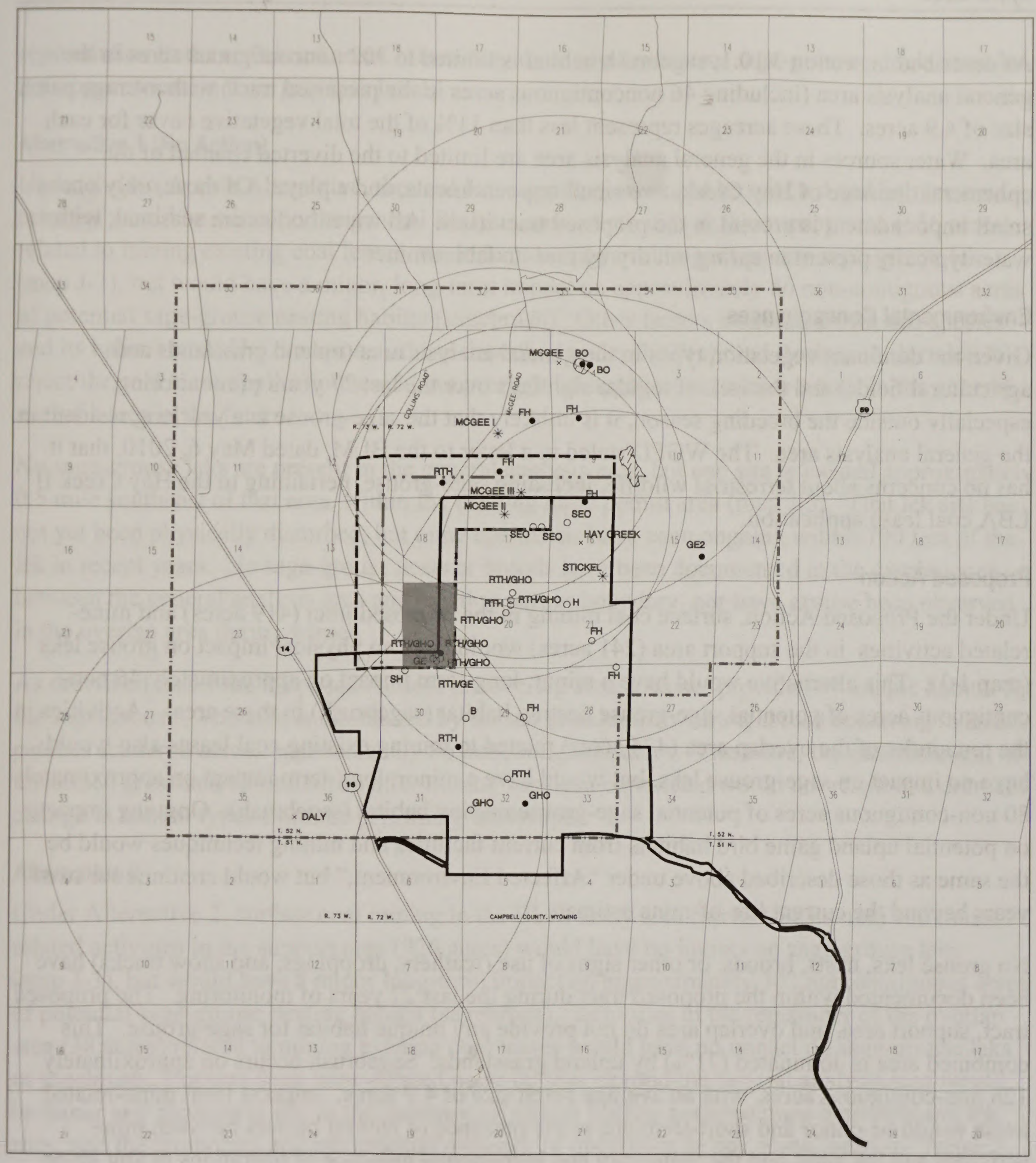
Three sage-grouse lek sites have been documented at the Buckskin Mine over the last 27 years of annual monitoring (table J-3); none of these sites is within the general analysis area (map J-3). The Daly sage-grouse lek has been inactive for the last 17 consecutive years and is considered abandoned by the WGFD. The remaining two leks have also been inactive in recent years, but are still classified as occupied. The Hay Creek lek is within the existing Buckskin Mine permit area, approximately 0.5 mile southeast of the general analysis area. This site has been or will be affected by previously permitted disturbance in the permit area. The McGee sage-grouse lek is approximately 1.25 miles north of the general analysis area, and the abandoned Daly lek site is approximately 0.75 mile west of the permit area and on the far side of U.S. Highway 14-16.

The Daly sage-grouse lek has been monitored annually since 1984 (table J-3). The greatest number of males recorded there was 20 in both 1984 and 1985. Peak male counts vacillated over the next seven years, but attendance gradually declined through 1992. No grouse were observed at the lek itself from 1993 through 2010. Two males were seen displaying approximately 1,000 feet south of the historic Daly lek site on one occasion in late April 2002, but no grouse were recorded in that area during any subsequent surveys. Those two birds were presumed to have flushed from an active lek site approximately 2 miles south of the Daly lek.

The Hay Creek sage-grouse lek is located in the northeastern corner of the existing Buckskin Mine permit area. The lek was active every year from 1984 through 1992, with a peak count of 27 males in 1988. The site was not visited in 1993 or 1994, but no birds were observed during periodic checks from 1995 through 2000. Through 2000, the lek site was beyond the required annual monitoring area (existing permit boundary and 1-mile radius) for the Buckskin Mine; the mine surveyed the lek voluntarily during this period. Annual monitoring of the Hay Creek lek resumed from 2001 through 2010, except in 2007; the lek was not accessible that year due to mine operations. Two displaying males and three hens were seen at the lek on one morning in 2001, but no grouse were present during additional checks that year, or in subsequent monitoring years.

The McGee sage-grouse lek is located beyond the required annual monitoring area for the Buckskin Mine and, therefore, is not included in that monitoring program. A WGFD biologist first recorded the lek in 2001. Biologists with that agency monitored the lek each year through 2005 and again in 2008; surveys were conducted by independent biologists in 2009 and 2010. The peak male count during that period was the original six birds discovered in 2001. No birds were seen at the McGee sage-grouse lek during five of the eight survey years, though the landowner reported birds present there in 2008 (the WGFD count was zero during three separate counts that year).

No grouse nests or broods for either species have been encountered in the general analysis area during targeted surveys or incidental to surveys conducted for other species. No sage-grouse have been observed during winter, though site visits occur less often at that time of year.



N

0 5,000 10,000

feet

- Raptor Nest – Intact
- Raptor Nest – Former Site
- Sharp-Tailed Grouse Lek – Occupied 2-mile perimeter
- Sage-Grouse Lek – Occupied 3-mile perimeter

B	Buteo Species
BO	Burrowing Owl
FH	Ferruginous Hawk
GE	Golden Eagle
GHO	Great Horned Owl
H	Northern Harrier
RTH	Red-tailed Hawk
SEO	Short-eared Owl
SH	Swainson's Hawk

- Buckskin Mine Permit Boundary
- General Analysis Area
- Applicant Proposed Tract
- BLM Study Area
- 2-Mile Wildlife Survey Perimeter
- Prairie Dog Colony
- County Road
- State Highway

No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 3.10-1

Raptor Nests, Prarie Dog Colonies, and Grouse Leks in the Wildlife Survey Area

As described in section 3.10.1, sagebrush habitat is limited to 302 noncontiguous acres in the general analysis area (including 46 noncontiguous acres in the proposed tract) with average patch size of 4.9 acres. These acreages represent less than 11% of the total vegetative cover for each area. Water sources in the general analysis area are limited to the diverted channel of the ephemeral drainage of Hay Creek, two small impoundments, and a playa. Of those, only one small impoundment is present in the proposed tract itself. All water bodies are seasonal, with water typically present in spring but dry by mid- to late summer.

Environmental Consequences

Given the dominant vegetation types in the general analysis area (upland grasslands and agricultural fields) and the lack of regular sightings over the last 27 years of monitoring, especially outside the breeding season, it is unlikely that the sage-grouse is a yearlong resident in the general analysis area. The WGFD stated in a letter to the BLM, dated May 6, 2010, that it has no concerns about terrestrial wildlife, including sage-grouse, pertaining to the Hay Creek II LBA coal lease application.

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mine-related activities in the support area (241 acres) would have no physical impact on grouse leks (map J-3). This alternative would have a minor, long-term impact on approximately 46 non-contiguous acres of potential sage-grouse nesting habitat (sagebrush) in these areas. Activities in the remainder of the overlap area (474 acres) related to mining existing coal leases also would have no impact on sage-grouse leks, but would have a minor, long-term impact on approximately 80 non-contiguous acres of potential sage-grouse nesting habitat (sagebrush). Ongoing impacts on potential upland game bird habitats from current facilities and mining techniques would be the same as those described above under "Affected Environment," but would continue for two years beyond the current life-of-mine estimate.

No grouse leks, nests, broods, or other signs of use (feathers, droppings, and snow tracks) have been documented within the proposed tract during the last 27 years of monitoring. The proposed tract, support area, and overlap area do not provide any unique habitat for sage-grouse. This combined area is dominated (71%) by upland grasslands. Sagebrush occurs on approximately 126 non-contiguous acres, with an average patch size of 4.9 acres. Impacts from mine-related noise would be minor and short-term due to the presence of natural buffers between mine activities and lek sites, and the temporary and incremental presence of operations in any given location.

Because the proposed tract is dominated by upland grasslands, the establishment of reclaimed grassland communities after mining has been completed would not result in a dramatic change in habitat types from the premining conditions. Some evidence has been documented that sage-grouse do repopulate areas after reclaimed shrublands have become established, but that process may take decades (Braun 1998). Estimates for the time it would take to restore shrubs, including sagebrush, to premine density levels range from 20 to 100 years, which may delay sage-grouse

repopulation in the reclaimed areas. Once they do return to an area, sage-grouse populations do not appear to attain their previous levels.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Activities in the overlap area (656 acres) related to mining existing coal leases would have no physical impact on any sage-grouse leks (map J-3), but would have a minor, long-term impact on approximately 86 non-contiguous acres of potential sage-grouse nesting habitat (sagebrush). Other factors associated with this species and its habitat would be the same as those described under the Proposed Action. A decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

No sage-grouse leks are present in the general analysis area, but one site is located approximately 0.5 mile southeast of that area, within the existing mine permit area (map J-3). That lek site has not yet been physically disturbed, but mine operations have been ongoing within 700 feet of the lek in recent years. No sage-grouse nests or broods have been documented in the overlap area between the general analysis area and existing permit boundary, nor have grouse been observed in the overlap area during winter.

As described under the Proposed Action, the overlap area does not provide any unique habitat for the sage-grouse. The area is dominated by upland grasslands, with sagebrush occurring in small patches scattered across approximately 86 noncontiguous acres. Therefore, the establishment of reclaimed grassland communities after mining has been completed would not result in a dramatic change in habitat types from the premining landscape.

Alternative 2

Under Alternative 2, surface coal mining in the BLM study area (up to 1,883 acres) and mine-related activities in the support area (926 acres) would have no impact on sage-grouse leks (map J-3), but would have a minor long-term impact on approximately 302 non-contiguous acres of potential sage-grouse nesting habitat (sagebrush). Activities in the remainder of the overlap area (38 acres) related to mining existing coal leases would have no impact on sage-grouse leks or sagebrush. Impacts from mine-related noise on leks beyond the general analysis area would be minor and short-term due to the presence of natural buffers between mine activities and lek sites, and the temporary and incremental presence of operations in any given location. Impacts on known and potential upland game bird habitats from current facilities and mining techniques would be the same as those described above under the Proposed Action, but would continue for up to six years beyond the current life-of-mine estimate.

No sage-grouse leks occur within the general analysis area (map J-3). The nearest sage-grouse lek (Hay Creek) is within the existing permit area approximately 0.5 mile to the southeast and, thus, is already subject to disturbance from previously permitted activities. The McGee sage-grouse lek is on private surface approximately 1.25 miles north of the general analysis area. That site is on the far side of multiple ridges that provide a visual and audio buffer, and it is not likely

to be affected by mine operations. Sage-grouse were last observed at the Hay Creek lek in 2001 and the McGee lek in 2004; both are considered occupied by the WGFD.

Disturbance and reclamation activities would be temporary and occur incrementally throughout the general analysis area. If mining activities disturb an active lek, grouse would have to use an alternate site or establish a new lek for breeding activities.

In addition to lek sites, areas of suitable habitat for nesting and other seasonal needs are necessary to sustain sage-grouse populations. One recent study suggests that availability of winter habitat can also affect sage-grouse populations (Naugle et al. 2006). The general analysis area is dominated (71% of total cover) by upland grasslands and agricultural fields, which do not provide the necessary shrub communities for forage and cover. Sagebrush in that area is limited to 302 noncontiguous acres, with an average patch size of approximately 4.9 acres. No grouse nests or broods have been documented in the general analysis area, nor have grouse been observed there during winter. Additionally, the general analysis area is not included in or within several miles of either a state sage-grouse core area or BLM sage-grouse focus area, though that does not preclude the need for grouse management when they are present.

The general analysis area does not provide any unique habitat for sage-grouse, and future mine operations would affect existing and potential habitat to varying degrees. As described previously, the prevalence of upland grasslands and the limited presence of surface water reduce the area's value to sagebrush obligates such as the sage-grouse.

Leasing, mining, and reclaiming a tract within the general analysis area would result in permanent alterations in the topography and long-term changes in vegetative composition from premine conditions. Because the general analysis area is dominated (71%) by upland grassland communities and agricultural lands, the establishment of reclaimed grassland communities after mining has been completed would represent similar or somewhat improved wildlife habitats, respectively, compared to those in the premining landscape. Restoration of sagebrush communities that are present could be difficult to accomplish through artificial plantings, and can take decades through natural regeneration. Until sagebrush returns to its premining density, a reduction in potential habitat for wildlife species associated with that habitat would occur in the general analysis area.

Some evidence has been documented that sage-grouse do repopulate areas after reclaimed shrublands have become established, but that process may take decades (Braun 1998). Estimates for the time it would take to restore shrubs, including sagebrush, to premine density levels range from 20 to 100 years, which may delay sage-grouse repopulation in the reclaimed areas. Once they do return to an area, sage-grouse populations do not appear to attain their previous levels. Once they do return to an area, sage-grouse populations have not yet been documented at their previous levels.

Cumulative Effects

Although the lands disturbed by future mining would be reclaimed in accordance with the requirements of SMCRA and Wyoming statutes, some residual wildlife impacts would occur. Areas that currently support sagebrush would be altered to a grassland community, perhaps for decades, during the interim between sage plantings and maturity in reclamation. This would reduce the carrying capacity of the land for shrub-dependent species, though such impacts would be mediated by the limited presence of sagebrush and riparian (brood-rearing) habitats in the general analysis area. Until such habitats have been fully reestablished, transitions from sagebrush to grassland communities would likely result in some changes in wildlife species composition. Shrubland species may repopulate reclaimed areas, but populations may not attain premining levels. As indicated, the limited presence of sagebrush communities in the general analysis area would help minimize such residual impacts.

Proposed Species

Mountain Plover (Charadrius montanus)

The USFWS originally proposed to list the mountain plover as a threatened or endangered species under the ESA in February 1999, and amended that proposal in December 2002. The agency withdrew the listing proposal in September 2003 based on the conclusion that information available at that time did not indicate the threats to the mountain plover and its habitat were likely to endanger the species in the foreseeable future. In June 2010, the USFWS reinstated the 2002 proposed rule to list the mountain plover as a threatened species and invited public comments. As a result of that reinstated proposal, the BLM was required to confer with the USFWS on any action that could jeopardize the continued existence of any species proposed for listing under the ESA.

On May 11, 2011, after a thorough review of all available scientific and commercial information, the USFWS determined that the mountain plover is not threatened or endangered throughout all or a significant portion of its range, including Campbell County, Wyoming, the Hay Creek II general analysis area (76 FR 92). Consequently, this species was removed from the listing process under the ESA. However, due to the timing of that decision, the following discussion of mountain plovers has been retained. Additionally, the mountain plover continues to be protected under the Migratory Bird Treaty Act and as a sensitive species under BLM policy (Bureau Manual 6840.06 E. Sensitive Species). Furthermore, the USFWS encourages project planners to develop and implement protective measures for mountain plovers that occur within their project areas.

Biology and Habitat Requirements

The mountain plover breeds from southeastern Alberta and southwestern Saskatchewan through central Montana, south to south-central Wyoming, east-central Colorado and northeastern New Mexico, and east to northern Texas and western Kansas. In Wyoming, this species is a common summer resident (Cerovski et al. 2004). Mountain plovers require flat grasslands with short and sparse vegetation, and a large bare ground component (Knopf 1996) for nesting, foraging, or

staging. Within the PRB, heavily grazed prairie dog colonies generally provide the most suitable mountain plover habitat.

Mountain plovers are monogamous and possibly polyandrous ground nesters, and typically produce at least two clutches. The nest is a shallow depression occasionally thinly lined with grass. Plovers may utilize the same nesting area in subsequent years (Dechant et al. 2003). Adults and fledged chicks leave the breeding grounds by early August, and may stage within appropriate habitats before migrating. Plovers feed primarily upon insects. Beetles, grasshoppers, crickets, and ants are the most important prey items (Knopf 1996). This species is highly approachable and does not flee far. Mountain plover populations have historically declined, and recent data suggest that this species is continuing to decline in numbers. Causes of population declines have been primarily attributed to regional changes in agricultural practices (Knopf 1996).

Affected Environment

No prairie dog colonies (potential mountain plover habitat) are present within the general analysis area. The upland grasslands that dominate the area lack the specific characteristics (shorter, less dense grasses) typically associated with this species. No mountain plovers have been documented in the general analysis area or at the adjacent Buckskin Mine during the last 27 years (1984 through 2010) of annual monitoring.

Environmental Consequences

No impacts on mountain plovers are anticipated, because this species has never been documented during the last 27 years of annual monitoring conducted for the adjacent Buckskin Mine, or during surveys conducted specifically for the Hay Creek II LBA. The survey area for the Buckskin Mine overlapped varying portions of the general analysis area each year. Additionally, typical suitable habitat (prairie dog colonies or other short and sparse vegetation) for this species is not present in the general analysis area, which makes it highly unlikely that populations have gone undetected during more than two decades of annual searches. However, should this species be present, it could be impacted by surface mining, if appropriate habitat were disturbed.

Cumulative Effects

The lands disturbed by future mining would be reclaimed in accordance with the requirements of SMCRA and Wyoming statutes, though some residual wildlife impacts would occur. Areas that currently support short, sparse vegetation would be transformed to a taller, denser grassland community. This would reduce the carrying capacity of the land for short-grass species, though such impacts would be mediated by the limited presence of such habitats in the general analysis area.

Cumulative Impacts

Cumulative impacts are defined under NEPA as the incremental impacts of past, present, and reasonably foreseeable future actions, including the proposed action, conducted by any entity

(e.g., federal, state, private). Cumulative impacts on threatened and endangered species and their habitats can result from both direct (physical) and indirect factors.

The net acreage of surface disturbance associated with energy-related activities in the Wyoming PRB has been increasing in recent years due to greater energy demands throughout the country and increasing prices for local energy resources. Existing habitat-disturbing activities in the PRB include: surface coal mining; conventional oil and gas development; CBNG development; uranium mining; sand, gravel, and scoria mining; ranching; agriculture; road, railroad, and power plant construction and operation; recreational activities; and housing (rural and urban) and business development. Mining, construction, agricultural activities, and urban development tend to have more intense impacts on fairly localized areas, while ranching, recreational activities, and oil and gas development (conventional and CBNG) tend to be less intensive but spread over larger areas. Oil and gas development and mining activities have requirements for reclamation of disturbed areas as resources are depleted.

Minimal residual impacts on current threatened and endangered, candidate, or proposed plant and animal species would occur, because no such species have ever been recorded in the general analysis area, and because state and federal regulations require reclamation of specific habitats important for these species. In the short term, mine-related activities in newly leased areas could result in the potential loss of individuals due to injuries or mortalities, as well as a reduction in the available habitat for threatened and endangered plant and wildlife species. In the long term, habitats will continue to be impacted, but they are also being and will continue to be restored in several areas as reclamation proceeds. To preclude or minimize future impacts on federally listed species and their habitats, species-specific protective measures included in the current Buckskin Mine permit document would be expanded and updated to include the final tract configuration prior to any surface disturbance associated with a new coal lease.

The BLM is in the process of completing a regional technical study of current and proposed or potential development activity in the PRB to help the agency evaluate the impacts of coal development in that area. The *Powder River Basin Coal Review* consists of three task reports.

- The completed Task 1 reports describe the existing situation through 2003, which reflects the past and present levels of development.
- The updated Task 2 Report defines the past and present activities in the PRB, based on actual levels of development through 2007 and current development estimates available through 2009, and projects reasonably foreseeable development in the Wyoming PRB through 2020 (BLM 2009).
- The Task 3 reports predict the cumulative impacts that could be expected to occur to air, water, socioeconomic, and other resources if the development occurs as projected in the forecast developed under Task 2.

The information about existing development in the following paragraphs is taken from the updated *Powder River Basin Coal Review* Task 2 report (BLM 2009) and BLM lease records. The completed PRB Coal Review reports can be accessed from the BLM Wyoming web site at

http://www.wy.blm.gov/minerals/coal/prb/prbdocs.htm. The project area for Tasks 1 and 2 of the PRB Coal Review encompasses over 8 million acres and includes all of Campbell, Sheridan, and Johnson counties and the northern portion of Converse County in northeastern Wyoming.

Oil and gas exploration and production have been ongoing in the PRB for more than 100 years. Conventional (non-CBNG) oil and gas fields are, for the most part, concentrated in the central and southern parts of the structural basin. Development of the CBNG resources from the coal beds is a more recent occurrence, with CBNG production in the Wyoming PRB starting in the late 1980s. As of 2003, an estimated 187,761 acres had been disturbed in the coal review project area as a result of oil and gas development activities, but approximately 115,045 acres (61%) of that disturbance has been reclaimed. This includes conventional oil and gas and CBNG wells, and associated facilities and major transportation pipelines.

The BLM estimates that the existing federal coal leases in the Wyoming PRB include approximately 121,185 acres. The currently pending federal coal LBA tracts as applied for (including the proposed tract) include approximately 35,245 additional acres. The majority of the coal in the areas currently permitted for surface coal mining is federal, but state and private leases are also included within some of the existing mine permit areas. All of the current and proposed federal coal leases are concentrated near the outcrop of the Wyodak coal bed, which is located in eastern Campbell County and the extreme northeastern edge of Converse County. That bed includes the Anderson and Canyon coal seams that are within the general analysis area.

As of 2007, the updated year for the PRB Coal Review, the surface coal mining operations along the Wyodak outcrop had disturbed approximately 83,593 acres. Approximately 24,338 of those acres of disturbance are occupied by "permanent" mine facilities, such as roads, buildings, coal handling facilities, etc., that are not available for reclamation until after coal mining operations end. Of the remaining 59,255 acres of disturbance available for reclamation, approximately 25,884 acres (44%) had been reclaimed. Reclamation of the balance of 33,371 acres, which represent areas of active mining and areas where coal has been recovered but reclamation has not been completed, would proceed concurrently with coal mining. The *Powder River Basin Coal Review* identified an estimated 5,802 additional acres of coal-related development disturbance (i.e., coal-fired power plants, railroads, and coal technology projects) as of 2007.

The total estimate of disturbed acreage related to all types of development in the Wyoming PRB in 2007 was 222,568 acres. In addition to coal and oil and gas activities, this total includes disturbance associated with construction of reservoirs and industrial fabrication firms, as well as public and private infrastructure such as highways and roads, government buildings, and residential and commercial real estate development. It should be noted that some of these disturbances overlap one another. In such cases, the disturbance acreage is counted separately under each category, but is not counted twice in determining the total area of disturbance. These disturbances do not have the same reclamation requirements as coal and oil and gas industries.

Cumulative effects could also occur to any threatened and endangered plant and wildlife resources present in the area as a result of indirect impacts; no such species have been documented there to date. One factor is the potential import and spread of noxious weeds around

roads and facilities. Noxious weeds have the ability to displace native vegetation and hinder reclamation efforts. Control of noxious weeds is addressed in surface coal mining and reclamation plans. If weed mitigation and preventative procedures are applied to all construction and reclamation practices, the impact of noxious weeds on threatened and endangered plants and wildlife would be minimized.

Of the 222,568 acres of total cumulative disturbance, approximately 113,382 acres (51%) have been reclaimed. The remaining 109,186 acres of disturbance would be reclaimed incrementally or following a project's completion, depending on the type of development activity and permit requirements. In reclaimed areas, vegetation cover often differs from undisturbed areas. In the case of surface coal mines, re-established vegetation would be dominated by species mandated in the reclamation seed mixtures (to be approved by WDEQ). The majority of the species in the approved reclamation seed mixtures are native to the area. Nevertheless, reclaimed areas may not recreate the ecosystem functions served by undisturbed vegetation communities and habitats for many years after reseeding has occurred. For example, species composition, shrub cover, and other habitat characteristics are likely to differ from pre-disturbance vegetation communities and habitats due to the extended time-frame typically necessary for mature shrub communities to become reestablished in mined areas. Invasion by noxious weeds and alteration of vegetation in reclaimed areas has the potential to alter threatened and endangered plant and wildlife habitat composition and distribution, depending on the species listed and their habitat requirements.

To date, no currently listed threatened and endangered species have been documented at any surface coal mine in the Wyoming PRB. However, some adverse effects to candidate and proposed species that could occur as a result of existing and potential activities in the PRB would include direct loss of habitat, indirect loss of habitat due to human and equipment disturbance, and habitat fragmentation. As described above, all existing coal mines in the Wyoming PRB have agency-approved monitoring and mitigation plans, as well as species-specific protective measures in place to protect threatened and endangered species, per SMCRA (at 30 CFR 816.97) and Wyoming State regulations. If a maintenance coal tract is leased under one of the action alternatives considered in the Hay Creek II EIS, these permitting requirements would be extended to include mining operations within the new tract, including the development and approval of detailed plans to mine the coal and reclaim the affected areas.

References

Avian Power Line Interaction Committee (APLIC). 2006. *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006.* Edison Electric Institute, APLIC, and the California Energy Commission. Washington, D.C. and Sacramento, CA. 207pp.

Braun, C. E. 1998. Sage grouse declines in western North America: what are the problems? Proceedings *In* Western Association of State Fish and Wildlife Agencies. 78:139-156.

Cerovski, A.O., M. Grenier, B. Oakleaf, L. Van Fleet, and S Patla. 2004. Atlas of birds, mammals, amphibians, and reptiles in Wyoming. Wyoming Game and Fish Department, Nongame Program, Lander, WY. 206pp.

Christiansen, Tom. 2004. Wyoming Greater Sage-Grouse Population Trend Relative to the 2005 Hunting Season – A Summary Report and Recommendation. Available: http://gf.state.wy.us/wildlife.wildlife_management/sagegrouse/index.asp.

Connelly, J.W., S.T. Knick, M.A. Schroeder, and S.J. Stiver. 2004. Conservation Assessment of Greater Sage-grouse and Sagebrush Habitats. Western Association of Fish and Wildlife Agencies. Unpublished Report, Cheyenne, WY.

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. Washington D.C.: Government Printing Office.

Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, C. M. Goldade, M. P. Nenneman, and B. R. Euliss. 2003. Effects of management practices on grassland birds: Mountain Plover. Northern Prairie Wildlife Research Center, Jamestown, ND. Jamestown, ND: Northern Prairie Wildlife Research Center Home Page. http://www.npwrc.usgs.gov/resource/literatr/grasbird/mopl/mopl.htm (Version 12DEC2003).

Emmerich, John, Deputy Director. Wyoming Game and Fish Department, Cheyenne, WY. April 10, 2007—telephone conversation with Teresa Johnson, BLM, Casper Field Office, Casper, WY.

Fertig, W. 2000. State Species Abstract, Wyoming Natural Diversity Database- *Euthamia graminifolia*. Wyoming Natural Diversity Database, Laramie, WY.

Fertig, W. and G. Beauvais. 1999. Wyoming Plant and Animal Species of Special Concern. Unpublished report. Wyoming Natural Diversity Database, Laramie, WY.

Fertig, W., R. Black, and P. Wolken. 2005. Rangewide Status Review of Ute Ladies'-Tresses (*Spiranthes diluvialis*). May 17. Prepared for U.S. Fish and Wildlife Service and Central Utah Water Conservancy District. Available: http://mountain-prairie.fws.gov/species/plants/uteladiestress/SPDI_Status%20review_Fertig2005.pdf.

Grenier, M. 2003. An Evaluation of Black-footed Ferret Block Clearances in Wyoming: Completion Report. Wyoming Game and Fish Department, Lander, WY. 16pp.

Heidel, B. 2001. Monitoring Ute Ladies'-tresses (*Spiranthes diluvialis*), in Jefferson County, Montana, final report, 1996–2000. Prepared for U.S. Bureau of Land Management, Montana State Office and Butte Field Office, by the Montana Natural Heritage Program, Helena, MT.

———. 2007. Survey of Ute ladies'-tresses (Spiranthes diluvialis) in eastern Wyoming, 2005–2006. Prepared for U.S. Bureau of Land Management and the Medicine Bow/Routt National Forest/Thunder Basin National Grassland. Wyoming Natural Diversity Database, Laramie, WY.

Knopf, F. L. 1996. Mountain plover (*Charadrius montanus*). *In* The Birds of North America, No. 211 (A. Poole and F. Gill, Editors). The Academy of Natural Sciences, Philadelphia, Pennsylvania, and The American Ornithologists' Union, Washington, D.C.

LandTrak Resources, Inc. 2009. Buckskin Mining Company Hay Creek II LBA Threatened & Endangered Species Survey, BLM Data Adequacy Report. On file with the BLM High Plains District Office, Casper, WY

———. 2011. Buckskin Mining Company Hay Creek II Amendment, D8 Vegetation Baseline Report. On file with the Wyoming Department of Environmental Quality, Sheridan, WY.

Naugle, D. E., C. L. Aldridge, B. L. Walker, T. E. Cornish, B. J. Moynahan, M. J. Holloran, K. Brown, G. D. Johnson, E. T. Schmidtmann, R. T. Mayer, D. Y. Kato, M. R. Matchett, T. J. Christiansen, W. E. Cook, T. Creekmore, R. D. Falise, E. T. Rinkes, and M. S. Boyce. 2004. West Nile virus: pending crisis for greater sage-grouse. *Ecology Letters* 7:704–713.

Naugle, D. E., K. E. Doherty, and B. L. Walker. 2006. Sage-grouse Winter Habitat Selection and Energy Development in the Powder River Basin: Completion Report. Available: http://www.voiceofthewild.org/sagegrousestudies.

Natural Resources Conservation Service (NRCS). 2008. Web Soil Survey. Last revised June 20, 2007. Available: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx. Accessed: May 19, 2008.

State of Wyoming: Executive Department. 2010. Executive Order: 2010-4. Cheyenne, WY. June.

University of Wyoming. 2009. Wyoming Natural Diversity Database—State Species Abstract (*Penstemon haydenii*) Blowout Penstemon—Family: *Scrophulariaceae*. Available: http://www.uwyo.edu/wynddsupport/docs/Reports/SpeciesAbstracts/Penstemon_haydenii.pdf>.\f C \l. Accessed: January 2009.

U.S. Bureau of Land Management (BLM). 1987. Data Adequacy Standards.

———. 2001. 2001 Approved Resource Management Plan for Public Lands Administered by the BLM Buffalo Field Office. Buffalo, WY.

———. 2006. BLM Resource Recovery and Protection Plan. Approved June 16, 2006.

———. 2008. Wyoming's Threatened and Endangered Plant Species Blowout Penstemon. U.S. Government Printing Office: 2008-760-342/48004 Region No. 8, BLM/WY/GI-08/020+1150.

———. 2009. Update of the Task 2 Report for the Powder River Basin Coal Review – Past and Present and Reasonably Foreseeable Development Activities. December. Prepared for the BLM High Plains District Office and Wyoming State Office by AECOM, Inc., Fort Collins, CO. Available: <http://www.blm.gov/wy/st/en/programs/energy/Coal_Resources/PRB_Coal/prbdocs.html>.

U.S. Forest Service. 2002. Updated Land and Resource Management Plan for the Thunder Basin National Grassland, Medicine Bow-Routt National Forest, Rocky Mountain Region. USDA Forest Service, Medicine Bow-Routt national Forest, Rocky Mountain Regional Office, Denver, CO.

U.S. Fish and Wildlife Service (USFWS). 1995. Recommendations and Guidelines for Ute Ladies'-tresses Orchid (*Spiranthes diluvialis*). Recovery and Fulfilling Section 7 Consultation Responsibilities. June 1. 7 pp.

———. 2004. File letter ES-61411/BFF/WY7746 issuing block clearance for black-footed ferrets in all black-tailed prairie dog colonies throughout Wyoming, and select white-tailed prairie dog colonies. Wyoming Field Office of the U.S. Fish and Wildlife Service, Cheyenne, WY.

———. 2007. Wetlands Online Mapper, NWI Maps. Accessed: November 10, 2007.

———. 2008. Endangered, Threatened, and Candidate Species and Designated Critical Habitat for Wyoming Counties. February. Available: http://www.fws.gov/mountainprairie/endspp/CountyLists/Wyoming.pdf. Accessed: October 2008.

———. 2010. Endangered, Threatened, and Candidate Species and Designated Critical Habitat for Wyoming Counties. July. Available: http://www.fws.gov/mountainprairie/endspp/CountyLists/Wyoming.pdf. Accessed: July 2010.

Wyoming Game and Fish Department (WGFD). 2008a. Northeast Wyoming Working Group 2007 Annual Sage-grouse Completion Report. Buffalo, WY. Available: http://gf.state.wy.us/wildlife/wildlife_management/sagegrouse/pdf/2007sgjcrsbyregion/2007NortheastJCR.pdf.

———. 2008b. Statewide 2007 Annual Sage-grouse Completion Report. Cheyenne, WY. Available: http://gf.state.wy.us/wildlife/wildlife_management/sagegrouse/pdf/2007sgjcrsbyregion/2007StatewideJCR.pdf.

———. 2010. Wyoming Sage-Grouse Definitions: revised 2/09/10. Available from the Wyoming Game and Fish Department, Cheyenne, WY.

APPENDIX K

BUREAU OF LAND MANAGEMENT SENSITIVE SPECIES EVALUATION

APPENDIX K: BUREAU OF LAND MANAGEMENT SENSITIVE SPECIES EVALUATION

INTRODUCTION

Each Wyoming Field Office of the Bureau of Land Management (BLM) has a prepared list of sensitive species to focus management efforts towards maintaining habitats important to those species under a multiple use mandate. The authority for this policy and guidance comes from the Endangered Species Act of 1973, as amended; Title II of the Sikes Act, as amended; the Federal Land Policy Management Act of 1976 (43 U.S.C. 1716); Department Manual 235.1.1A; and BLM Manual 6840.06 E. Sensitive Species.

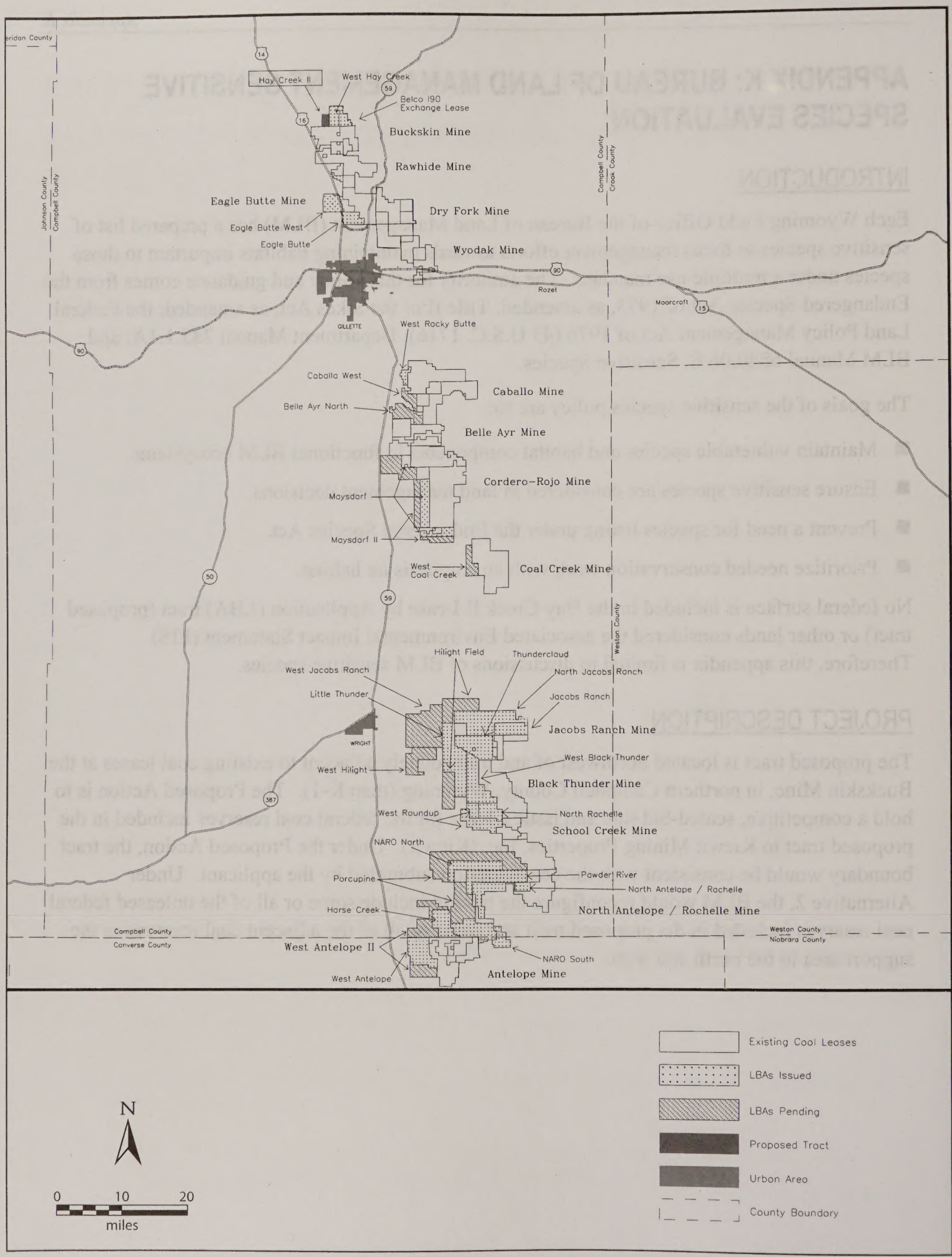
The goals of the sensitive species policy are to:

- Maintain vulnerable species and habitat components in functional BLM ecosystems.
- Ensure sensitive species are considered in land management decisions.
- Prevent a need for species listing under the Endangered Species Act.
- Prioritize needed conservation work with an emphasis on habitat.

No federal surface is included in the Hay Creek II Lease by Application (LBA) tract (proposed tract) or other lands considered the associated Environmental Impact Statement (EIS). Therefore, this appendix is limited to discussions of BLM sensitive species.

PROJECT DESCRIPTION

The proposed tract is located northwest of and immediately adjacent to existing coal leases at the Buckskin Mine, in northern Campbell County, Wyoming (map K-1). The Proposed Action is to hold a competitive, sealed-bid sale and issue a lease for the federal coal reserves included in the proposed tract to Kiewit Mining Properties, Inc. (Kiewit). Under the Proposed Action, the tract boundary would be consistent with the configuration submitted by the applicant. Under Alternative 2, the BLM would reconfigure the tract to include some or all of the unleased federal coal reserves included in the proposed tract and some or all of the adjacent coal reserves in the support area to the north and west.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map K-1

General Location Map with Federal Coal Leases and LBA Tracts

The physical areas discussed in this appendix are defined as follows:

- proposed tract—the Hay Creek II LBA tract as applied for (419 acres);
- BLM study area—proposed tract plus lands added by the BLM under Alternative 2 for the analysis process (1,883 acres); and
- general analysis area—the maximum area of potential surface disturbance (2,847 acres) that would result from leasing the largest possible tract (i.e., the entire BLM study area and the 0.25-mile mine support area to the north and west)[1].

Map K-2 illustrates these three areas.

Under the Proposed Action, coal extraction would occur in the entire proposed tract (approximately 419 acres). Activities related to mining the proposed tract would occur within the support area, a 0.25-mile-wide area north and west of the proposed tract (approximately 241 acres); disturbance from existing mine-related activities would continue in the remainder of the overlap area[2] (approximately 474 acres).

Under Alternative 1, disturbance from mine-related activities associated with existing coal leases would continue in the overlap area (approximately 656 acres).

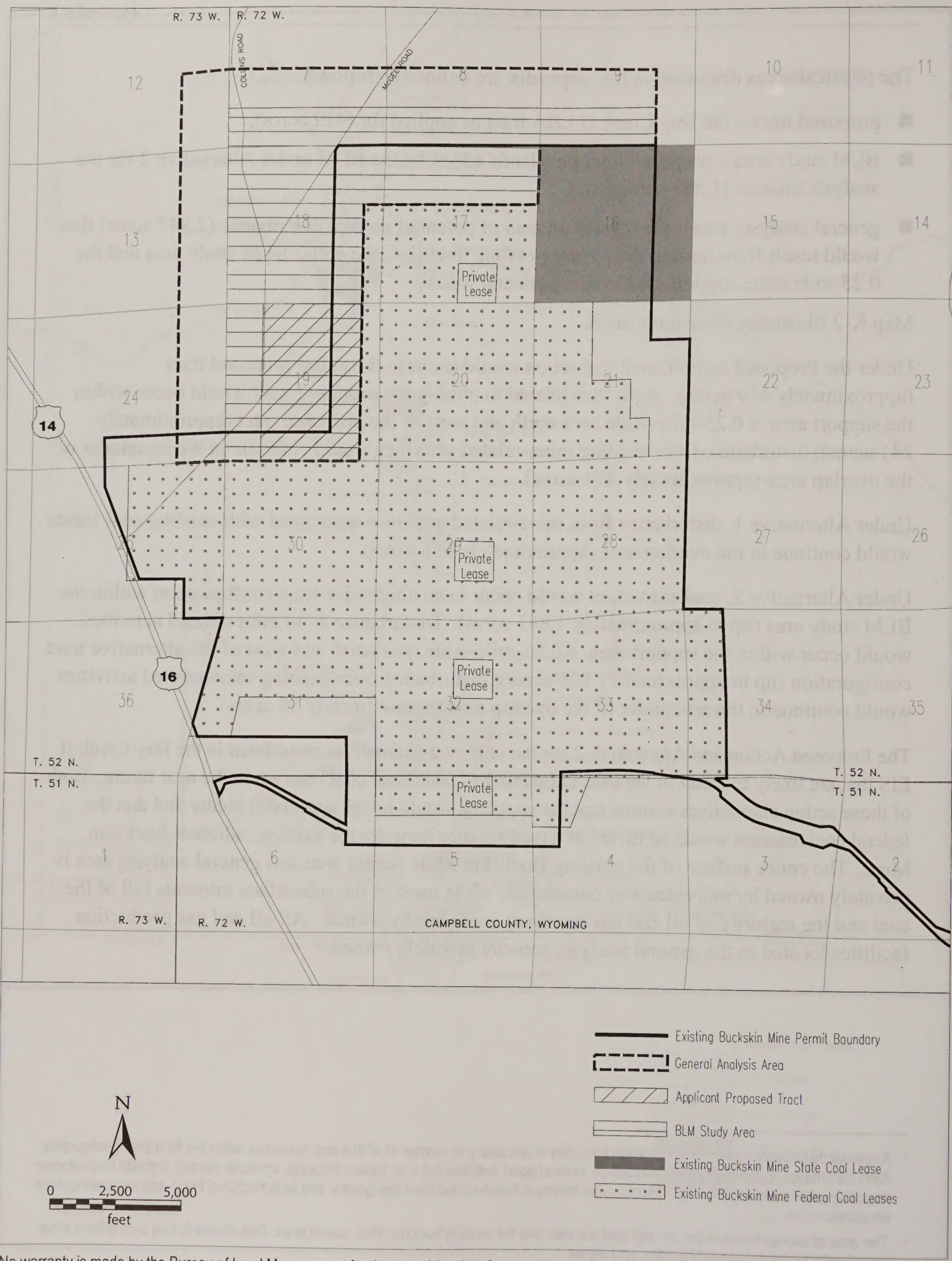
Under Alternative 2, coal extraction would occur in an alternative tract configuration within the BLM study area (up to approximately 1,883 acres). Disturbance from mine-related activities would occur within the support area, a 0.25-mile-wide area north and west of the alternative tract configuration (up to approximately 926 acres); disturbance from existing mine-related activities would continue in the remainder of the overlap area (approximately 38 acres).

The Proposed Action and Alternative 2 are the only two alternatives considered in the Hay Creek II EIS that are likely to result in the sale and mining of additional coal reserves in the near future. Both of those action alternatives assume that the applicant would be the successful bidder and that the federal coal reserves would be mined as a maintenance lease for the existing, adjacent Buckskin Mine. The entire surface of the existing Buckskin Mine permit area and general analysis area is privately owned by individuals or companies, while most of the subsurface minerals (all of the coal and the majority of oil and gas reserves) are federally owned. All oil and gas production facilities located in the general analysis area are privately owned.

---

[1] Additional disturbance beyond the final lease boundary is necessary to recover all of the coal resources within the final tract configuration. Such disturbance includes, but is not limited to, mine support activities such as topsoil stripping, stockpile storage highwall back-sloping (including catch benches), highwall reduction after mining to match undisturbed topography, and construction of flood- and sediment-control structures.

[2] The area of overlap between the general analysis area and the existing Buckskin Mine permit area. Disturbance in this area is from mine-related activities associated with existing coal leases.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map K-2
General Analysis Area

SPECIES OCCURRENCE AND HABITAT DESCRIPTIONS

Due to the location of the general analysis area in northeastern Wyoming, the vertebrate and plant sensitive species list for the BLM Buffalo Field Office was used as a reference for the following discussion. The list includes all species within the range of authority for that field office. The current wildlife list (BLM 2002) can be found on the official Wyoming BLM website. The plant list was updated in November 2008, and can be found on the BLM botany website for the Buffalo Field Office (BLM 2008).

Species that have been delisted or removed from the federal listing process under the Endangered Species Act automatically revert to Sensitive Species status for the BLM. Therefore, the black-tailed prairie dog (*Cynomys ludovicianus*), bald eagle (*Haliaeetus leucocephalus*), and mountain plover (*Charadrius montanus*) were added to the 2002 list. No prairie dog colonies are present within the general analysis area, and no mountain plovers have ever been documented in that area or at the adjacent Buckskin Mine during the last 26 years (1984 through 2009) of annual monitoring.

Therefore, neither species is discussed further in this document. Bald eagles are occasional winter residents in the area, and are discussed below.

The greater sage-grouse (*Centrocercus urophasianus*) has never been observed in the general analysis area; that area is dominated (71%) by upland grassland and agricultural lands, with little sagebrush. Due to its classification in March 2010 as a candidate species for listing under the Endangered Species Act, the sage-grouse is discussed in appendix I (Biological Assessment for Federally Listed Species under the Endangered Species Act).

No plant sensitive species have been recorded in the general analysis area during previous annual monitoring (Table K-1).

Table K-1 lists the sensitive species, summarizes their habitat requirements, and indicates if they have been observed in the general analysis area. This list was reviewed prior to beginning field surveys. Vertebrate observations were based on annual wildlife monitoring conducted in the overlapping survey area for the Buckskin Mine since 1984, as well as field surveys and file searches completed from 2007 through 2009 specifically for this analysis. Vegetation sampling is also conducted annually in portions of the existing Buckskin Mine permit area, particularly in reclaimed habitats. Baseline surveys have also been completed as the permit area has expanded over the years, with additional targeted surveys conducted for federally listed plants prior to disturbance in some years. Plant surveys related to this analysis were conducted primarily in 2008, with some follow-up surveys conducted in 2009.

Only two vertebrate sensitive species have been documented in the general analysis area in the last 26 years; the bald eagle and loggerhead shrike (*Lanius ludovicianus*). Although the bald eagle is a common winter resident in portions of northeast Wyoming, sightings within the annual wildlife monitoring area for the Buckskin Mine have averaged less than one bird per year since 1984. That survey area encompassed the entire proposed tract and much of the general analysis

area each year. Potential bald eagle roosting and nesting habitat in the general analysis area is limited to three tree shelterbelts, with few additional trees in the surrounding area. One of the shelterbelts is in the portion of the general analysis area that overlaps with the existing permit area and is, therefore, subject to future disturbance regardless of the leasing action. The other two shelterbelts are adjacent to currently or recently occupied residences. A few isolated bald eagle nesting attempts have been recorded in northeast Wyoming over the years, but none have occurred within several miles of the Hay Creek II general analysis area or adjacent mines. No unique or concentrated prey sources (e.g., fisheries, sheep operations, large prairie dog colonies, concentrations of waterfowl) that would attract bald eagles are present in the area.

Loggerhead shrikes have occasionally been recorded in the general analysis area, including in the proposed tract. However, most shrike sightings occurred in grasslands and tree windbreaks in the west-central portion of the existing Buckskin Mine permit area, beyond the general analysis area. Adults and juveniles were periodically observed perched on fences and power lines in that area. Although no active nests have ever been found, the presence of young indicates that shrikes nest in the vicinity in some years.

The absence or extremely limited presence of specialized habitat types, such as forests and woodlands, caves, cliffs, large expanses of wetlands and lakes, and calcareous rock outcrops, among others, make it unlikely that species restricted to those habitats would occur in the general analysis area. Additional information on the occurrences of various species of interest in and near the general analysis area can be found in the data reports prepared in support of the Hay Creek II EIS and the annual reports prepared for the Buckskin Mine. These documents can be viewed at the BLM Wyoming High Plains District Office in Casper, Wyoming, and the Wyoming Department of Environmental Quality/Land Quality Division in Sheridan, Wyoming, respectively.

Table K-1. BLM Sensitive Species (Buffalo Field Office), Habitat Requirements, and Observations for the Hay Creek II LBA

Common Name (Scientific name)	Habitat[1]	Observed in the General Analysis Area
AMPHIBIANS		
Northern leopard frog *(Rana pipiens)*	Swampy cattail marshes, beaver ponds, and other permanent water in the plains, foothills, and montane zones up to 9,000 feet	No; no suitable habitat
Spotted frog (*Ranus pretiosa*)	Ponds, sloughs, small streams in foothills and montane zones	No; general analysis area is beyond species range; no suitable habitat
BIRDS		
Baird's sparrow (*Ammodramus bairdii*)	Shortgrass eastern Great Plains grasslands, weedy fields	No; general analysis area is beyond typical range for this species; no suitable habitat
Bald eagle[2] (*Haliaeetus leucocephalus*)	Mixed coniferous forests, cottonwood-riparian near large lakes and rivers; forages in open habitats during the winter	Occasionally present in winter; limited winter roosting and nesting habitat; no reliable or concentrated sources of prey
Brewer's sparrow (*Spizella breweri*)	Basin-prairie and mountain-foothills shrublands, especially sagebrush, woodland-chaparral	Extremely infrequently; limited suitable sagebrush habitats
Burrowing owl (*Athene cunicularia*)	Grasslands, basin-prairie shrublands, agricultural areas, prairie dog colonies	No; limited potential nesting habitat
Ferruginous hawk *(Buteo regalis)*	Basin-prairie shrublands; eastern Great Plains, Great Basin foothills, and mountain-foothills grasslands; rock outcrops, isolated trees	No; limited potential nesting habitat
Greater sage-grouse (*Centrocercus urophasianus*)	Basin-prairie shrub, mountain-foothill shrub meadows	No; limited suitable sagebrush and other year-round habitats
Loggerhead shrike (*Lanius ludovicianus*)	Basin-prairie shrub, mountain-foothill shrub	Infrequent non-breeder; limited habitat
Long-billed curlew (*Numenius americanus*)	Sagebrush-grasslands; eastern Great Plains, Great Basin foothills, mountain foothills, and wet-moist meadow grasslands; irrigated native meadows; with aquatic areas nearby, other agricultural areas and shorelines	No; limited wet or moist habitats for foraging; no suitable nesting habitat
Mountain plover[2] (*Charadrius montanus*)	Shortgrass and mixed grass prairies, Great Basin foothills grasslands, short sagebrush-grasslands, prairie dog colonies	No; no prairie dog colonies; grasslands typically too tall and/or dense
Northern goshawk (*Accipiter gentilis*)	Coniferous forests, especially Douglas fir and lodgepole pine, aspen; forages in a variety of habitats	No; no suitable habitat
Peregrine falcon (*Falco peregrinus*)	Cliffs, primarily along waterways	No; no suitable habitat
Sage sparrow (*Amphispiza billneata*)	Basin-prairie and mountain-foothills shrublands.	No; general analysis area is beyond typical species range in Wyoming; limited suitable sagebrush habitats
Sage thrasher (*Oreoscoptes montanus*)	Basin-prairie and mountain-foothills shrublands	No; limited suitable sagebrush habitats

Table K-1, continued

Common Name (Scientific name)	Habitat[1]	Observed in the General Analysis Area
Trumpeter swan (*Cygnus buccinator*)	Marshes, lakes, ponds, rivers	No; no suitable habitat
White-faced ibis *(Plegadis chihi)*	Marshes, wet-moist meadows, lakes, irrigated meadows	No; no suitable habitat
Yellow-billed cuckoo *(Coccyzus americanus)*	Open woodlands, streamside willow and alder groves; cottonwood-riparian below 7,000 feet, urban areas	No; no suitable habitat
FISH		
Yellowstone cutthroat trout *(Oncoryhynchus clarki)*	Yellowstone drainage, small mountain streams, large rivers	No; no suitable habitat
MAMMALS		
Black-tailed prairie dog[2] *(Cynomys ludovicianus)*	Short-grass and mid-grass grasslands	No; no prairie dog colonies
Fringed myotis (*Myotis thysanodes*)	Conifer forests, woodland chaparral, basin-prairie shrublands, caves and underground mine shafts	No; limited suitable sagebrush habitats
Long-eared myotis *(Myotis evotis)*	Conifer and deciduous forests, basin-prairie and mountain foothills shrublands, riparian areas	No; no suitable habitat
Spotted bat (*Euderma maculatum*)	Known only from juniper shrublands and desert sagebrush-grasslands in Wyoming; cliffs over perennial water are important habitat component	No; no suitable habitat
Swift fox (*Vulpes velox*)	Eastern great plains grasslands, occasionally agricultural areas, irrigated native meadows, roadside/railroad banks	No, suitable habitat present
Townsend's big-eared bat *(Corynorhinus townsendii)*	Deciduous forests, dry coniferous forests; basin-prairie; mountain foothills and shrublands; desert grasslands; juniper	No; limited suitable habitat
PLANTS		
Northern Arnica (*Arnica lonchophylla*)	Open woods and slopes on sandy-gravel or limestone and shady, moist north-facing birch-hazelnut forests; elevation 6,500–8,000 feet	No; no limestone parent material or birch-hazelnut forest habitats; known populations in Wyoming are in Sheridan and Johnson counties
Porter's sagebrush *(Artemisia porteri)*	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes; 5,300–6,500 feet	No; no habitat due to soil type; known populations in Wyoming are in Fremont County
Soft aster (*Aster mollis*)	Sagebrush grasslands and mountain meadows on deep, calcareous soils at the edge of aspen or pine woodlands; elevation 6,400–8,500 feet	No; no habitat; known populations in Wyoming are in Niobrara, Natrona, Sublette, Washakie, Big Horn, and Sheridan counties
William's wafer parsnip *(Cymopterus williamsii)*	Open ridgetops and upper slopes with exposed limestone outcrops or rockslides; 6,000–8,300 feet	No; habitat limitations include lower elevations and lack of limestone parent material; known populations in Wyoming are in Johnson, Washakie, and Natrona counties
Mountain lady's slipper (*Cypripedium montanum*)	Shady moist forests and riparian shrublands; elevation 5,400–5,500 feet	No; no habitat due to lack of shady forests and elevations; known populations in Wyoming are in Sheridan and Johnson counties

Table K-1, continued

Common Name (Scientific name)	Habitat[1]	Observed in the General Analysis Area
Rabbit buckwheat (*Eriogonum brevicaule var. canum [E. Lagopus]*)	Barren sandy or clay soils and rock outcrops in juniper woodlands and sagebrush steppe communities; elevation 3,800–5,500 feet	No; limited areas of habitat are present due to lack of juniper woodlands and rock outcrops; known populations in Wyoming are in Sheridan and Big Horn counties
Hall's fescue (*Festuca hallii*)	Meadows, slopes, and open woods; elevation 7,400–10,500 feet	No; no habitat present due to low elevations and lack of montane meadows and open woods; known populations in Wyoming are in Park and Johnson counties
Contracted Indian ricegrass (*Oryzopsis contracta [O. hymenoides var. c.]*)	Basin and foothill areas on dry, sandy soils; elevation 4,800–7,500 feet	No; habitat generally lacking or very limited; known populations in Wyoming are in Campbell, Washakie, Hot Springs, Natrona, Sweetwater, Carbon, and Albany counties
Cary's beardtongue *(Penstemon caryi)*	Calcareous rock outcrops and rocky soil within sagebrush, juniper, Douglas-fir, and limber pine communities; elevation 5,200–8,500 feet	No; no habitat present due to low elevations and lack of soils and vegetation communities where this species is found; known populations in Wyoming are found in Big Horn, Washakie, and Sheridan counties
Northern blackberry (*Rubus arcticus ssp. acaulis [R. acaulis]*)	Boggy woods and marshes; elevation 7,000–9,000 feet	No; no habitat present due to low elevation and lack of vegetation communities where this species is found; known populations in Wyoming are found in Johnson County
Hapeman's sullivan (*Sullivantia hapemanii* var. *hapemanii*)	Moist calcareous outcrops and boulders in shady canyons and streams; elevation 4,600–8,200 feet	No; limited habitat due to lack of topography and moisture conditions where this species is found; known populations in Wyoming are found in Sheridan, Johnson, Natrona, Big Horn, and Washakie counties

[1] Habitats for vertebrate terrestrial species primarily from Cerovski et al. 2004.

[2] Former listed or candidate species under the Endangered Species Act automatically revert to BLM Sensitive Species upon delisting or removal from the federal listing process.

REFERENCES

U.S. Bureau of Land Management (BLM). 2002. Sensitive Species Policy and List. September 22. Available: <http://www.blm.gov/pgdata/etc/medialib/blm/wy/wildlife.Par.9226.File.dat/02species.pdf>. Accessed: March 2010.

U.S. Bureau of Land Management (BLM). 2008. Buffalo Field Office Sensitive Species. November. Available: < http://www.wy.blm.gov/botany/fieldoffices/bfo.htm>. Accessed: May 2010.

GPO U.S. GOVERNMENT PRINTING OFFICE: 2011 — 760-085 / 34003 Region No. 8

REFERENCES